Sharing a Government

Jaume Ventura

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Abstract

This paper develops a simple theoretical framework to study a set of regions, each with its own regional government, who share a union or central government. These governments must decide whether to implement or discard a large number of projects that produce local benefits for the region that implements them, and externalities for the rest of the regions. Conflict or disagreement arises since different regions value projects differently. The classic assignment problem consists of deciding who decides these projects, either the union or the regional governments.

It is well known that regional governments are insensitive to externalities. The key observation here is that the union government is insensitive to local benefits. Thus, each government maximizes only a piece of the value of projects, and disregards the other one. This observations leads to simple and clear rules for solving the assignment problem.

JEL Classification: D72, D79, F15, F55, H77

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†CREI, Universitat Pompeu Fabra and Barcelona GSE. E-mail: jventura@crei.cat. I thank Janko Heineken and Ugur Yesilbayraktar for excellent research assistance. I am grateful to Alessandra Bonfiglioli, Fernando Broner, Gino Gancia, Teresa Garcia-Milà, Alberto Martin, Martí Mestieri and, especially, to Giacomo Ponzetto for very helpful comments. I acknowledge financial support from the Centre de Recerca en Economia Internacional (CREI), through the European Research Council (ERC), under the European Union's Horizon 2020 Programme, Grant Agreement 693512 ("Globalization, Economic Policy and Political Structure"), the Generalitat de Catalunya (CERCA program and grant 2014 SGR 830) and the Barcelona GSE.

1 Introduction

The topic of this lecture is the costs and benefits of centralizing or decentralizing political decisions. This is a timely topic given the pace at which the European project is moving forward. Notwithstanding recent setbacks, such as the Brexit vote, the European Union holds more political power now than ever before. And yet, this power pales when compared to that of the United States federal government. Should the power of the European Union grow up to that of the US federal government? Should it stop short of this? Why? What sort of decisions should be made by the European Union? Which ones should remain in the member states?

Europe has a long and robust tradition of empire-building and subsequent breakup, which is the old way to move from a decentralized to a centralized political system and back. Hopefully, the use of war to change the political structure of the state is a thing of the past. But the tensions to change country borders will remain alive and strong for the foreseeable future. They are indeed at the forefront of political debates in the United Kingdom, Belgium, Spain and elsewhere. And these tensions are nothing but a struggle between central governments that want to impose their decisions on regions that want to decide on their own. What decisions should be made by the central government? What decisions should be left to the regional governments?

Finding a democratic and efficient way to decide the geographical shape of the state is a major problem facing Europe today. And I strongly believe that academic economists have much to contribute to its solution. The questions are clear, but the answers are complex and tend to generate strong disagreement. Some of this disagreement is opportunistic. For instance, majority groups favor centralization because this allows them to impose their views on geographically concentrated minorities. But much of this disagreement is honest, and it reflects instead competing assumptions about the workings of governments. Thus, an important research goal is to sort out the arguments and explore the precise role that different assumptions play in them.

Let me state quickly, though, that I do not have an 'easy fix' or a 'quick solution' to this problem. My modest goal here is of an academic and methodological nature. It relates to the way I think we should approach this problem, and not about making a specific proposal to solve it. To make any serious progress, though, I must first define the problem in narrow, concrete terms.

Consider a set of regions, each with its own regional government, who share a union or

central government. You can think of the union as the European Union and the regions as the member states. You could also think of the union as the German federal government and the regions as the Länder. These governments must decide whether to implement or discard a large number of projects such as building a new infraestructure, changing public health or pensions coverage, enacting new laws that regulate the banking industry, imposing restrictions on school curricula, and many others. These projects produce local benefits to the region that implements them, but they also produce externalities to the rest of the regions. Conflict or disagreement arises since different regions value projects differently.

The classic assignment problem consists of deciding who decides these projects, either the union or the regional governments. The research goal is to identify, for a given project type, which level of government makes the best decisions. For instance, it could be that regional governments make better decisions on education, while the union government makes better decisions on banking regulation. This is exactly what we want to know.

The traditional or "public finance" approach (Oates 1972, 1999) assumes that governments are benevolent in the sense that they do what is best for their constituencies. Regional governments maximize local benefits, but disregard externalities that do not affect their constituencies. The union government maximizes the total value of projects, including both local benefits and externalities, since its constituency is the whole union. To avoid the boring (and absurd!) conclusion that all policy decisions should be centralized, this approach assumes that the union government cannot taylor or match policies to local preferences. This policy-uniformity constraint makes the union government less efficient than regional governments. The latter can produce different decisions for each region, while the union government must adopt the same decision for all regions.[1]

Thus, the assignment problem consists of choosing the least of two evils: (i) regional governments that are efficient but have the wrong preferences; or (ii) a union government that is inefficient, but has the right preferences. If externalities are large in absolute value, regional governments make poor decisions and it is best to let the union government decide. If policy preferences are very heterogeneous, the union government makes poor decisions and it is best to let regional governments decide. In policy applications, these are the simple recipes that are used again and again to reach conclusions on who should decide on pensions, infrastructures, monetary policy or education.

There is also a modern or "political economy" approach that grew up from a dissatis-

[1] The "public finance" approach often assumes that the union government is able to exploit economies of scale, while the regional governments cannot coordinate to do so. I ignore this issue in this lecture.

faction with the assumption that governments are benevolent.[2] The first issue is preference aggregation. If regions have different preferences, how is it exactly that the union government aggregates these preferences in such a way that it ends up maximizing the total value of the projects, including both local benefits and externalities with the right weights? We know, at least since Arrow's impossibility theorem, that reasonable social choice mechanisms are unreliable and often lead to suboptimal outcomes. This turns out to be the case also in this context as shown, for instance, by Lockwood (2002), Besley and Coate (2003) and Harstadt (2007).[3] The second issue is agency. Even if preferences aggregate well, how is it exactly that policymakers end up having incentives to maximize these preferences and not their own? The answer, of course, is that often they do not, and this also leads to suboptimal outcomes. The implications of this observation have been explored, for instance, by Beasley and Case (1995), Seabright (1996),[4] Bardhan and Mookherjee (2000), Besley and Smart (2007) and Boffa, Piolatto and Ponzetto (2016).

The modern approach is insightful, stimulating and full of novel ideas that capture interesting aspects of reality. But it is fair to say too that this approach has not generated yet a consensus view that either confirms or replaces the traditional approach in policy applications. Some papers strive to find micro-foundations or justifications for the traditional approach. Other papers do the opposite, illustrating its shortcomings and limitations. And still some papers do both things at the same time. Going through this literature is exciting and fun, but one is left at the end a bit dizzy, somewhat confused about the big picture. Is it possible to distill from this modern approach simple and sharp results that can guide policy applications? If so, how do they compare to the basic recipes of the traditional view?

I provide in this lecture partial and tentative answers to these questions. Throughout, I ignore the agency problem and focus exclusively on preference aggregation. A integrated treatment of both sides of the problem is obviously desirable, but I shall not attempt it here. To study this issue, I use a model that is closely related to Lockwood (2002). I show that this model exhibits a deep symmetry in the assignment problem that somehow has gone unnoticed so far. The recipes for policy applications that emerge from it are as simple and clear as those provided by the traditional approach. But they are quite different, as I explain

[2] See Lockwood (2006) for an excellent survey of this literature. Treisman (2007) provides a book-length treatment of arguments in favor and against centralization that covers both the "public finance" and the "political economy" approaches.

[3] Of course, one could also ask what happens if regional governments do not aggregate well the preferences inside the region. See Lockwood (2008) on this point.

[4] The arguments of Seabright (1996), are further developed and clarified in Persson and Tabellini (2000).

next.

The key observation is that, once preference aggregation is modeled realistically, the union government is characterized by a strong insensitivity to local benefits.[5] Thus, the problem turns out to be much more symmetric than it is usually recognized. Regional governments maximize the value of local benefits and disregard externalities. But the union government maximizes the value of externalities and disregards local benefits. Each government maximizes only a piece of the value of projects, and disregards the other one. An intuition for this result is that governments have preferences that are close to those of their median voter. In the region, the median voter cares only about local benefits. In the union, the median voter cares only about externalities. This is a 'quick and dirty' intuition because I study a complex environment in which the median voter theorem does not apply generically. But it kind of works out this way at the end.

Throughout, I dispense with the policy-uniformity assumption. It is, at best, unclear why union governments cannot taylor policies to local preferences. In Germany or the United States, for instance, the federal government has far more resources and legal power than the Länder or the states. Thus, this inability of federal governments cannot be of a 'technological' nature. In the European Union resources and power are mostly held by member countries. But even in this case, there does not seem to be any real impediment for the European Union to adapt its policies to the specific needs of its member countries. Of course, union governments might choose or prefer not to taylor policies to local preferences, but this is another kettle of fish.

According to the view presented here, the assignment problem still consists of choosing the least of two evils. But these evils are of a different sort. Both regional and union governments are equally efficient. Both regional and union governments have the wrong preferences, but each of them in their own special way. Thus, a specific decision should be assigned to the level of government that has the least damaging preferences to handle it. If externalities are large *relative* to local benefits, regional governments are likely to make worse decisions that the union government. Thus, the latter should decide. If instead externalities are small *relative* to local benefits, it is regional governments that should decide. What matters for the assignment problem is not the size of externalities, but their size relative to local benefits. And, since there is no policy-uniformity constraint, heterogeneity of preferences does play its

[5] The point that the union government is less sensitive to local benefits than the traditional approach suggests has been a key theme of the political-economy approach. What is perhaps surprising here is how strong this insensitivity is.

usual role favoring regional governments. The union government can also taylor its decisions to local conditions if it wishes to do so.

The rest of the lecture is organized as follows. Section 2 develops a simple model with many regions, each of them with projects that produce local benefits to the region and externalities to other regions. To simplify the analysis, I assume that projects have no costs and externalities are uniformaly distributed across regions. Section 3 uses a strategic assumption about voting procedures that ensures that the median voter theorem literally applies. This allows me to derive the main results and their implications quickly with minimal effort. Section 4 relaxes this assumption and shows the results in full generality. Section 5 introduces project costs and non-uniform externalities and shows how these compications affect the analysis. Finally, section 6 concludes.

2 A model of public projects with local benefits and externalities

This section describes a world with many regions, each of them with a set of public projects. If implemented, these projects produce both local benefits for the region and externalities to the rest of the regions. The key issue is how to decide which projects to implement and which ones to discard.

2.1 Projects

The world contains a set of regions, indexed by $n = 1, ..., N$. The citizens of this world are uniformly distributed across these regions. There are many project types, and each region has exactly one project of each type. These projects produce local benefits in the region, β, and externalities in the other regions, ε. Both local benefits and externalities are measured in monetary terms. Ex-ante, all projects of a given type are identical. Ex-post, the quality of projects can differ across regions however. Thus, I define a project type as a distribution $F(\beta, \varepsilon)$; and the specific project of each region is a draw (β, ε) from $F(\beta, \varepsilon)$. To streamline the discussion, I assume that (i) projects have no costs, and (ii) externalities are uniformly distributed across regions so that each of them receives an amount $\dfrac{\varepsilon}{N-1}$ of externalities. I shall relax these assumptions in Section 5.

Figure 1 shows the project space. Let $\Pr(A)$ be the expected share of projects in the green area labeled A, that is:

$$\Pr(A) = \int_{(\beta,\varepsilon)\in A} dF(\beta, \varepsilon)$$

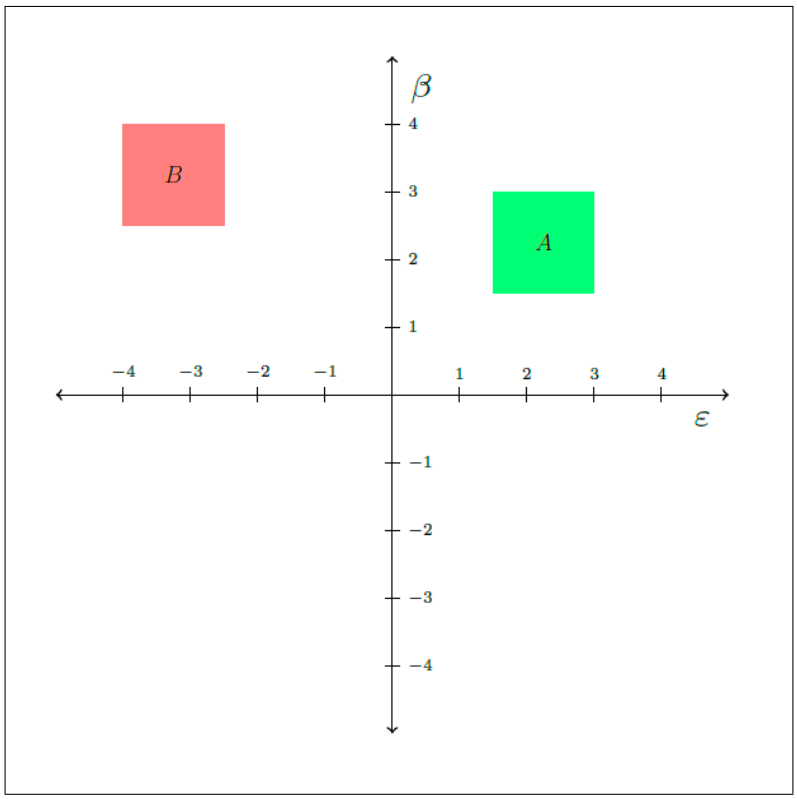

Figure 1: The project space

Throughout, I make statements such as "if region n is in A." This is a shortcut for the longer, but more precise statement "if the project of region n is in A." The expected value or expected monetary payoff of a project in A is given by:

$$E\left(\beta+\varepsilon\middle|\, A\right)=\int_{(\beta,\varepsilon)\in A}\left(\beta+\varepsilon\right)dF\left(\beta,\varepsilon\right)$$

Thus, the expected value (per region) of all projects in A is given by $E\left(\beta+\varepsilon\middle|\, A\right)\Pr\left(A\right)$. Throughout, I assume that N is large. Then, the probability that a project is in A is a good approximation for the ex-post share of projects in A. Also, the expected value (per region) of projects in A is a good approximation for the ex-post average value (per region) of projects in A. This simplifies some of the discussions.

The welfare of all citizens equals the expected value of the monetary payoffs received by their region. Thus, I refer to "the preferences of region n" as short for "the preferences of the citizens in region n." Projects in A in Figure 1 produce positive local benefits and positive externalities. Thus, all regions unanimously prefer to implement these projects. However, projects in B produce positive local benefits and negative externalities. Thus, the

region prefers to implement these projects while the other regions prefer to discard them. Note that conflict is concentrated in the second and fourth quadrants of the project space. Throughout, I refer to projects in these quadrants as conflictual, and to projects in the first and third quadrants as non-conflictual.

2.2 Parliaments

Decisions on projects are made by parliaments. There are $N+1$ parliaments, one for each region plus the union parliament. Representatives in regional parliaments are citizens from the corresponding region, while representatives in the union parliament are citizens from all regions in equal proportions. Parliaments always reach decisions by majority rule. But they might have different rules on whether projects are bundled in a single bill or not, or the order in which bills are voted, and so on.

Parliaments decide which projects to implement after their quality is known. Typically, parliaments decide on specific projects after researching and debating them, and this process reveals a lot of information. Thus, I assume that decisions can be made contingent not only on the project's region and type, but also on its specific characteristics or quality.

Project types are assigned to parliaments before the quality of specific projects is known. There is an assignment rule that assigns project types to parliaments. Let P be the parliament to which the project type is assigned, with $P \in \{R, U\}$, where R indicates the corresponding regional parliament and U the union parliament.[6] Since all regions are identical ex-ante, they all agree on the following assignment rule:

$$P = \arg\max E\left(\beta + \varepsilon \middle| P\right) \tag{1}$$

That is, the assignment rule maximizes the ex-ante value of projects. The fiscal constitution that embeds this rule is therefore an incomplete contract. It can be made contingent on a project's region and type, but it cannot be made contingent on the specific characteristics of a project or its ex-post realization. This is, I think, a realistic assumption.

[6] This is restrictive. It rules out, for instance, that a project type be assigned to both the regional and union parliaments and require unanimity. It also rules out that a project type of a given region be assigned to a regional parliament other than its own or the union's.

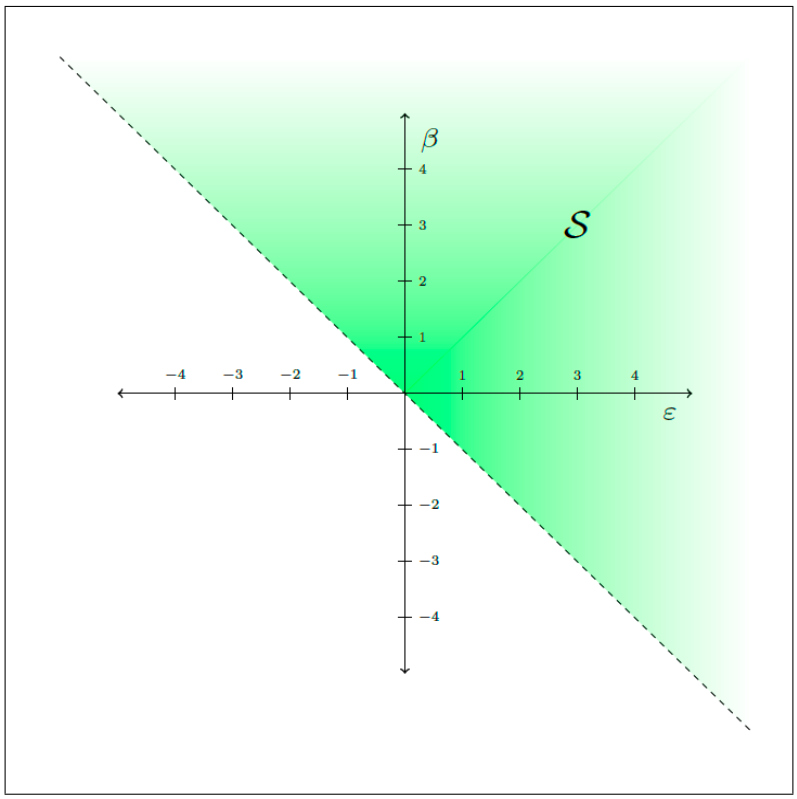

Figure 2: The set $\mathcal{S}$

2.3 Economic efficiency

Once a fiscal constitution is specified, projects are assigned to parliaments and the latter make decisions. This is enough to obtain positive results. But I also want to generate normative results, and this requires choosing a criterion to evaluate outcomes. I choose economic efficiency and value projects by their monetary payoffs. Thus, the set $\mathcal{S} \subseteq \mathbb{R}^2$ of efficient or socially desirable projects is:

$$\mathcal{S} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta + \varepsilon \geq 0\right\} \tag{2}$$

This set is shown in Figure 2. Essentially, socially desirable projects are those with non-negative value. Abusing language, I often say 'the set of decisions $\mathcal{S}$' as short for 'the set of decisions that would implement the set of projects $\mathcal{S}$'.

Let me stress that adopting economic efficiency as a normative criterion is not a foregone conclusion. Ex-post, if offered the chance to be a dictator, a citizen of region m would (i) implement her region's project only if it offers non-negative local benefits; (ii) implement other region's projects only if they produce non-negative externalities. Clearly, individual ex-

post preferences differ from social preferences. But given the symmetry assumed, individual ex-ante preferences coincide with social preferences. Indeed, ex-ante maximization of social preferences leads to the assignment rule in Equation (1).

Consider two sets of decisions $\mathcal{X} \subseteq \mathbb{R}^2$ and $\mathcal{Y} \subseteq \mathbb{R}^2$, respectively. We define the disagreement set between $\mathcal{X}$ and $\mathcal{Y}$ as $\mathcal{D}_{\mathcal{XY}} \equiv \left(\mathcal{X}^C \cap \mathcal{Y}\right) \cup \left(\mathcal{X} \cap \mathcal{Y}^C\right)$. Thus, we can interpret $\mathcal{D}_{\mathcal{XS}}$ as the set of mistakes in $\mathcal{X}$, and define the loss generated by $\mathcal{X}$ as follows:

$$\mathcal{L}_{\mathcal{X}} = E\left(|\beta + \varepsilon|| \, \mathcal{D}_{\mathcal{XS}}\right) \Pr\left(\mathcal{D}_{\mathcal{XS}}\right) \geq 0 \tag{3}$$

Equation (3) simply says that the loss produced by a set $\mathcal{X}$ equals the average loss per mistake times the share of mistakes. For instance, if $\mathcal{R}$ and $\mathcal{U}$ are the set of decisions made by the regional and union parliaments, respectively, then $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ are the sets of mistakes these parliaments make. And $\mathcal{L}_{\mathcal{R}}$ and $\mathcal{L}_{\mathcal{U}}$ are the costs of these mistakes. With this notation, we can write the assignment rule in Equation (1) as follows:

$$P = \begin{cases} R & \text{if } \mathcal{L}_{\mathcal{R}} \leq \mathcal{L}_{\mathcal{U}} \\ U & \text{if } \mathcal{L}_{\mathcal{R}} > \mathcal{L}_{\mathcal{U}} \end{cases} \tag{4}$$

That is, the assignment rule consists of choosing the parliament that minimizes the loss produced by mistakes.

3 A first assignment result

Consider first the case in which each project is voted in a separate bill. Project-by-project voting means that the policy space is unidimensional, i.e. each vote consists of choosing a scalar, say 1 for implement and 0 for discard. Since this scalar can take on two values only, preferences are single-peaked and the median voter theorem applies. The identity of the median voter depends on the parliament that makes the decision, and this parliament is determined by the fiscal constitution.

3.1 Parliaments and their logic

Assume first that projects are assigned to the regional parliaments. The median voter is a citizen of the region and the project is implemented if and only if local benefits are non-

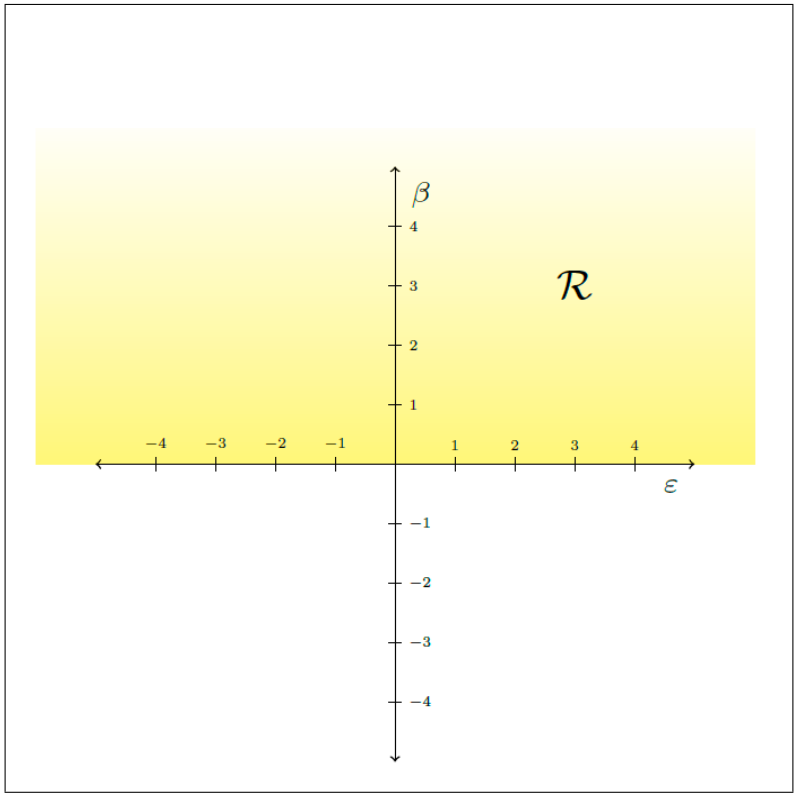

Figure 3: The set $\mathcal{R}$

negative. Thus, regional parliaments implement the following set of projects:

$$\mathcal{R} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta \geq 0\right\} \tag{5}$$

Figure 3 shows this set. Decisions by regional parliaments follow a strict logic of local-benefit maximization. This leads these parliaments to implement projects in the first and fourth quadrant of the project space, and to discard projects in the second and third quadrant.

Assume instead that projects are assigned to the union parliament, and consider again the decision on the project of region n. Since $N \geq 3$, the median voter is not a representative from region n and the project is implemented if and only if externalities are non-negative. Thus, the union parliament makes the following decisions:

$$\mathcal{U} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \varepsilon \geq 0\right\} \tag{6}$$

Figure 4 shows this set. Just opposite to regional parliaments, these decisions only consider externalities and ignore local benefits. As a result, projects in the first and second quadrant

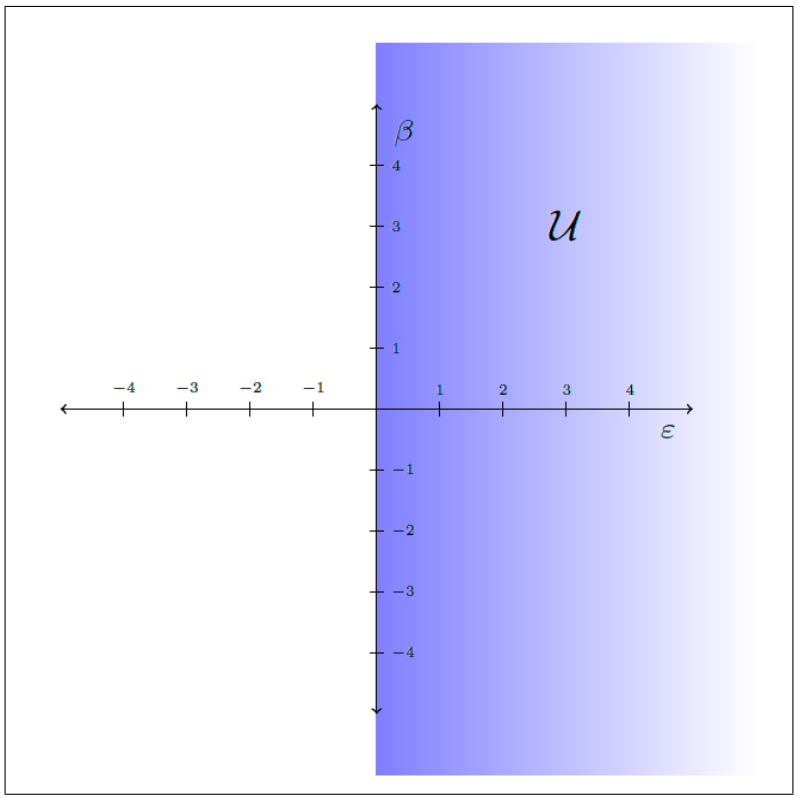

Figure 4: The set $\mathcal{U}$

of the project space are implemented, while projects in th third and fourth quadrant are discarded.

We can examine the mistakes made by the regional and union parliaments by looking at these disagreement sets:

$$\mathcal{D}_{\mathcal{RS}} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta\varepsilon < 0 \text{ and } |\beta| < |\varepsilon|\right\} \tag{7}$$

$$\mathcal{D}_{\mathcal{US}} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta\varepsilon < 0 \text{ and } |\beta| \geq |\varepsilon|\right\} \tag{8}$$

These sets are shown in Figure 5 in yellow and blue, respectively. Regional parliaments make two types of mistake: (i) projects with small negative local benefits are discarded even if they have large positive externalities, i.e. $\mathcal{R}^C \cap \mathcal{S}$; and (ii) projects with small positive local benefits are implemented even if they have large negative externalities, i.e. $\mathcal{R} \cap \mathcal{S}^C$. The union parliament also makes two types of mistakes: (i) projects with small negative externalities are discarded even if they have large positive local benefits, i.e. $\mathcal{U}^C \cap \mathcal{S}$; and (ii) projects with small positive externalities are implemented even if they have large negative local benefits, i.e. $\mathcal{U} \cap \mathcal{S}^C$.

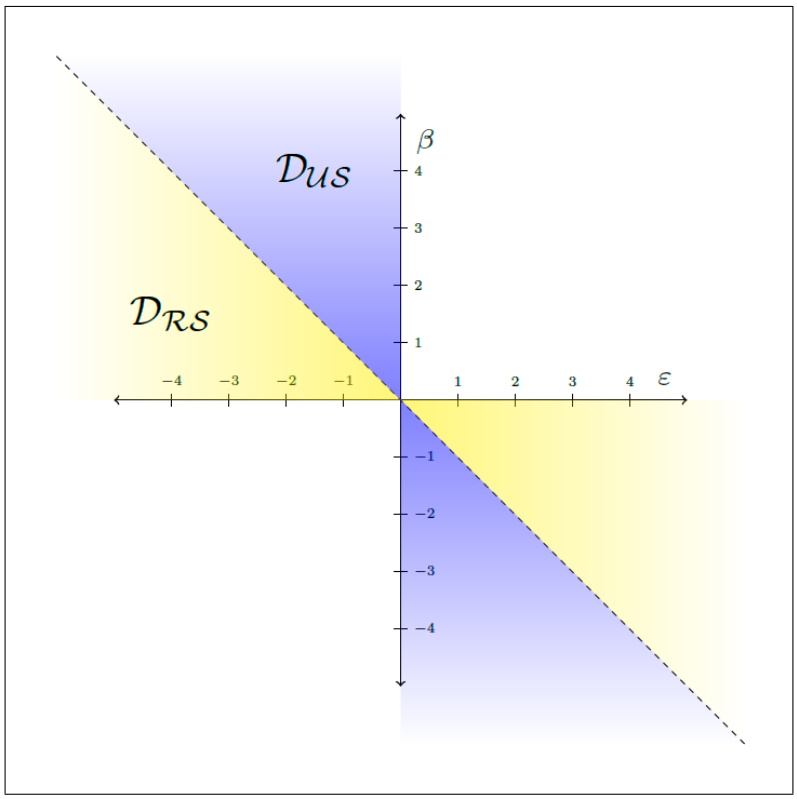

Figure 5: The sets $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$

Parliaments never agree to make the wrong decision. In the first and third quadrants (not colored), there is no conflict and both parliaments make the right decision. In the second and third quadrants, there is conflict. In the yellow region, the union parliament makes the right decision and the regional parliament makes the wrong one. In the blue region, the opposite occurs.

3.2 Efficient assignment

The following result follows quite naturally now:

Proposition 1 *Assume there are N regional parliaments plus one union parliament, and that each project is voted in a separate bill. Then, the assignment rule that maximizes economic efficiency assigns the projects to the union parliament if*

$$\mathcal{L}_{\mathcal{R}} = E\left(|\beta + \varepsilon|| \, \mathcal{D}_{\mathcal{RS}}\right) \Pr\left(\mathcal{D}_{\mathcal{RS}}\right) > E\left(|\beta + \varepsilon|| \, \mathcal{D}_{\mathcal{US}}\right) \Pr\left(\mathcal{D}_{\mathcal{US}}\right) = \mathcal{L}_{\mathcal{U}}$$

where $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ are defined in Equations (7) and (8), respectively. Otherwise, it assigns the projects to the corresponding regional parliament.

This is our first assignment result. It is based on the simple idea of assigning each project type to the parliament that makes less costly mistakes. Basically, we need to compare the absolute value of projects in the yellow and blue areas of Figure 5. If the absolute value of projects in the blue area is smaller than in the yellow area, we assign the project type to the union parliament. If the absolute value of projects in the blue area is not smaller than in the yellow area, we assign it to the regional parliaments instead. This is all very simple and intuitive, but it has some far-reaching implications.

The first one is the symmetry in treatment between local benefits and externalities. Statements such as "we should assign projects with small externalities to the region, and projects with large externalities to the union" do not follow from Proposition 1. It is not the size of externalities that matters, it is instead their size *relative* to the size of local benefits. Perhaps some project types produce large externalities. But if local benefits are even larger, Proposition 1 says that they should be assigned to the regions. Note also that it is the *absolute* size of local benefits and externalities that matters, that is, it is $|\beta|$ and $|\varepsilon|$ that enter the relevant definitions and not β and ε.

The second important implication is that the only projects that matter are those for which there is disagreement among parliaments. Statements such as "we should assign to the union projects with large externalities and small local benefits" do not follow from Proposition 1 either. The assignment rule does not depend on the unconditional characteristics of projects, but instead on their characteristics *conditional* on disagreement. Proposition 1 supports statements such as "we should assign to the union projects such that, *when there is disagreement among parliaments*, externalities are large relative to local benefits". Perhaps these projects have tiny externalities and huge local benefits when there is no disagreement, and perhaps there is disagreement only on a tiny share of projects. But this does not matter, Proposition 1 says that they should still be assigned to the union.

Figures 6–8 show some specific project types that help visualize the implications of Proposition 1. To produce these figures, I have assumed that project types are bivariate normals defined by five parameters: (i) two means, i.e. μ_β and μ_ε; (ii) two variances, i.e. σ^2_β and σ^2_ε; and (iii) one correlation coefficient, i.e. ρ. In all examples, I start with the standard bivariate normal, i.e. $\mu_\beta = \mu_\varepsilon = \rho = 0$ and $\sigma^2_\beta = \sigma^2_\varepsilon = 1$; and then explore the effects of specific changes in the shape of the distribution.

Figure 6 shows a family of project types that vary in μ_β and μ_ε, with $\mu_\beta + \mu_\varepsilon = 0$. The project types in this family feature different average sizes of local benefits relative to the average sizes of externalities, holding constant the average value of projects. The top middle

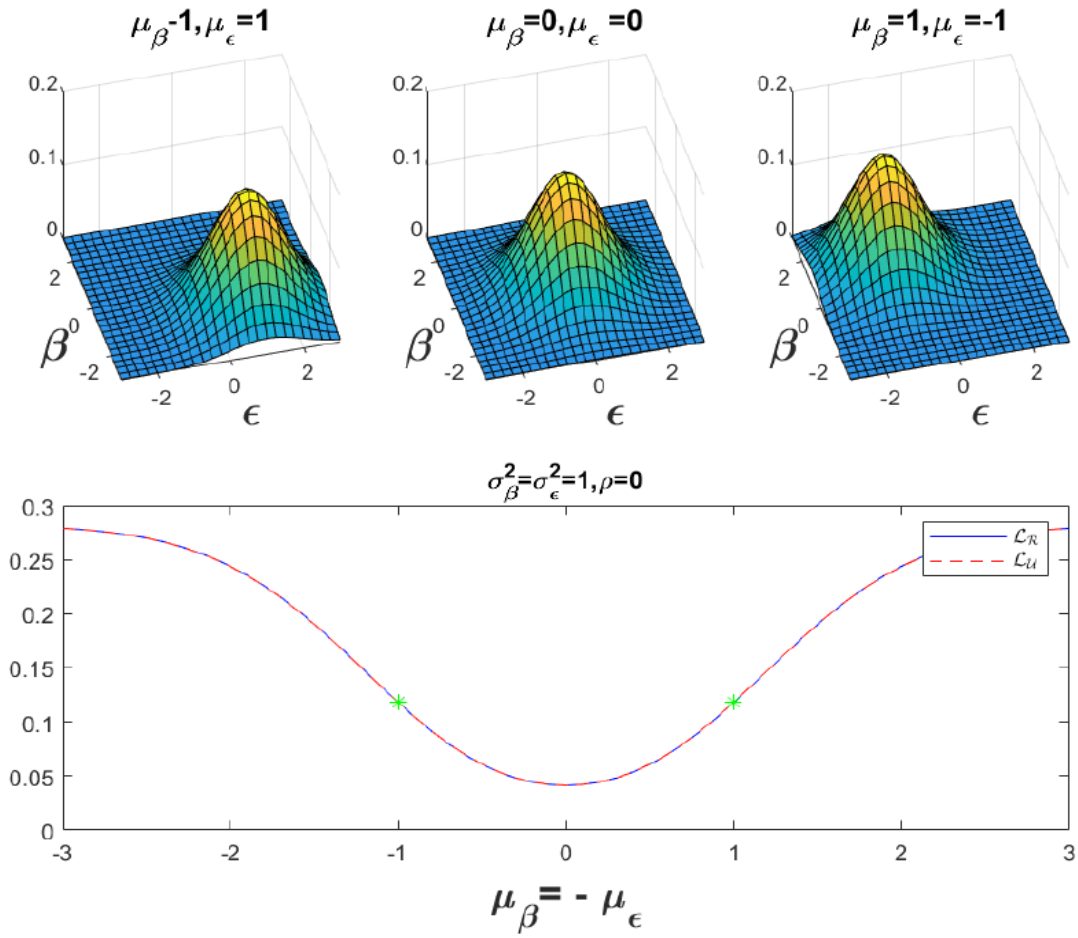

Figure 6: Effects of changing μ_β and μ_ε keeping $\mu_\beta + \mu_\varepsilon = 0$.

panel shows the standard project type, while the top left and right panels show project types for which which μ_β is small relative μ_ε, and vice versa. The bottom panel plots the cost of assigning projects to the regional and union parliaments against $\mu_\beta = -\mu_\varepsilon$, i.e. $\mathcal{L}_\mathcal{R}$ and $\mathcal{L}_\mathcal{U}$. These costs grow as we move away from the standard type. The reason is that disagreement grows as project types contain more mass in the second and fourth quadrants. Interestingly, though, the costs of regional and union parliaments grow together and they are always equal to each other. Thus, it never makes a difference whether we assign these project types to the regional or the union parliament. Although at first sight this result might seem paradoxical or unexpected, it is indeed quite natural. As mentioned already, what matters is not the simple size of local benefits and externalities, but instead their absolute size. And in all the types plotted in Figure 6, this absolute size is being held constant.

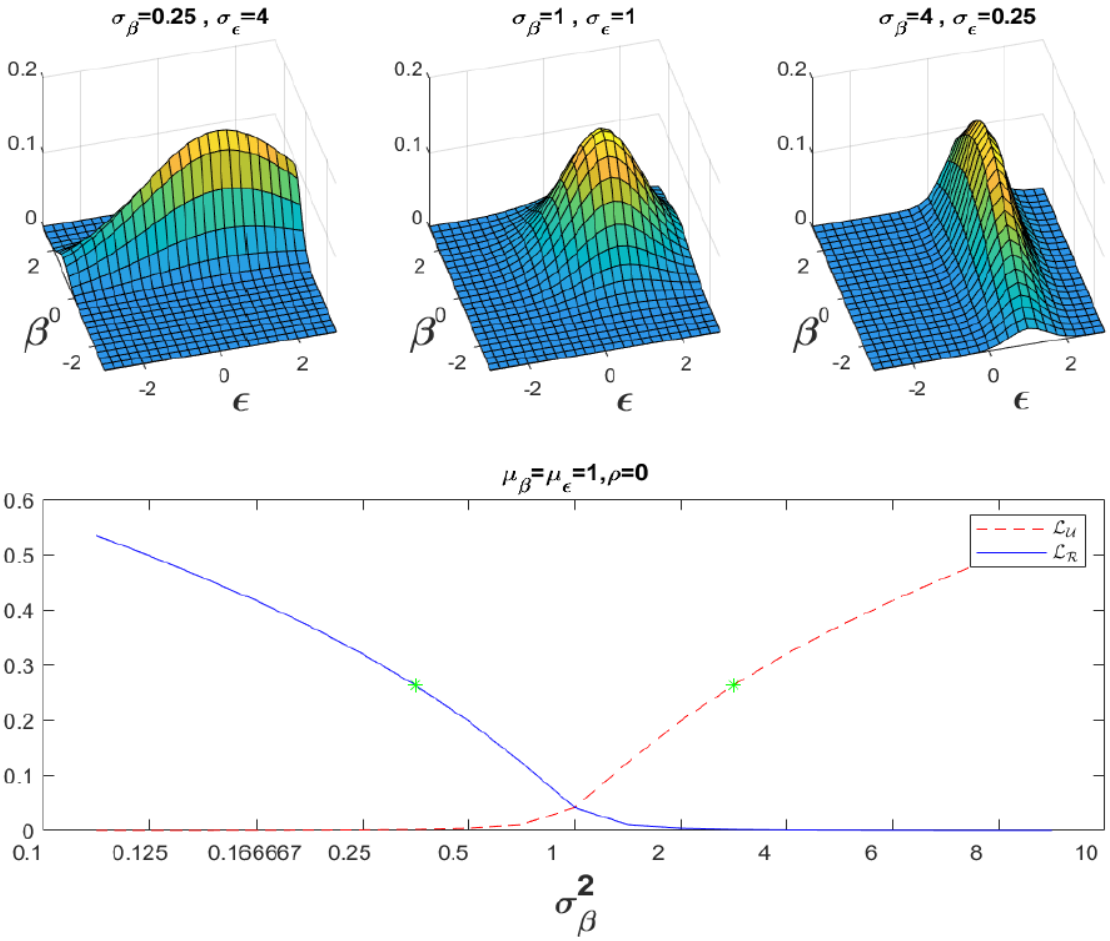

Figure 7: Effects of changing σ_β^2 and σ_ε^2 keeping $\sigma_\beta^2\sigma_\varepsilon^2 = 1$

Figure 7 shows a family of project types that vary in σ_β^2 and σ_ε^2, with $\sigma_\beta^2\sigma_\varepsilon^2 = 1$. The project types of this family have different absolute sizes of local benefits relative to the absolute sizes of externalities. Again, the top middle panel shows the standard type, while the top left and right panels show types for which σ_β^2 is small relative to σ_ε^2, and vice versa. The bottom panel now shows the cost of assigning project types to the regional and union parliaments against $\sigma_\beta^2 = \dfrac{1}{\sigma_\varepsilon^2}$. Now the distribution of mistakes and their costs shifts from one parliament to the other one as we move away from the standard type. If $\sigma_\beta^2 > \sigma_\varepsilon^2$, for most projects the absolute value of local benefits exceeds the absolute value of externalities and the union parliament makes costlier mistakes than the regional one. The opposite occurs if $\sigma_\beta^2 < \sigma_\varepsilon^2$. Thus, project types with $\sigma_\beta^2 \geq 1 \geq \sigma_\varepsilon^2$ should be assigned to regional parliaments, and the rest to the union parliament.

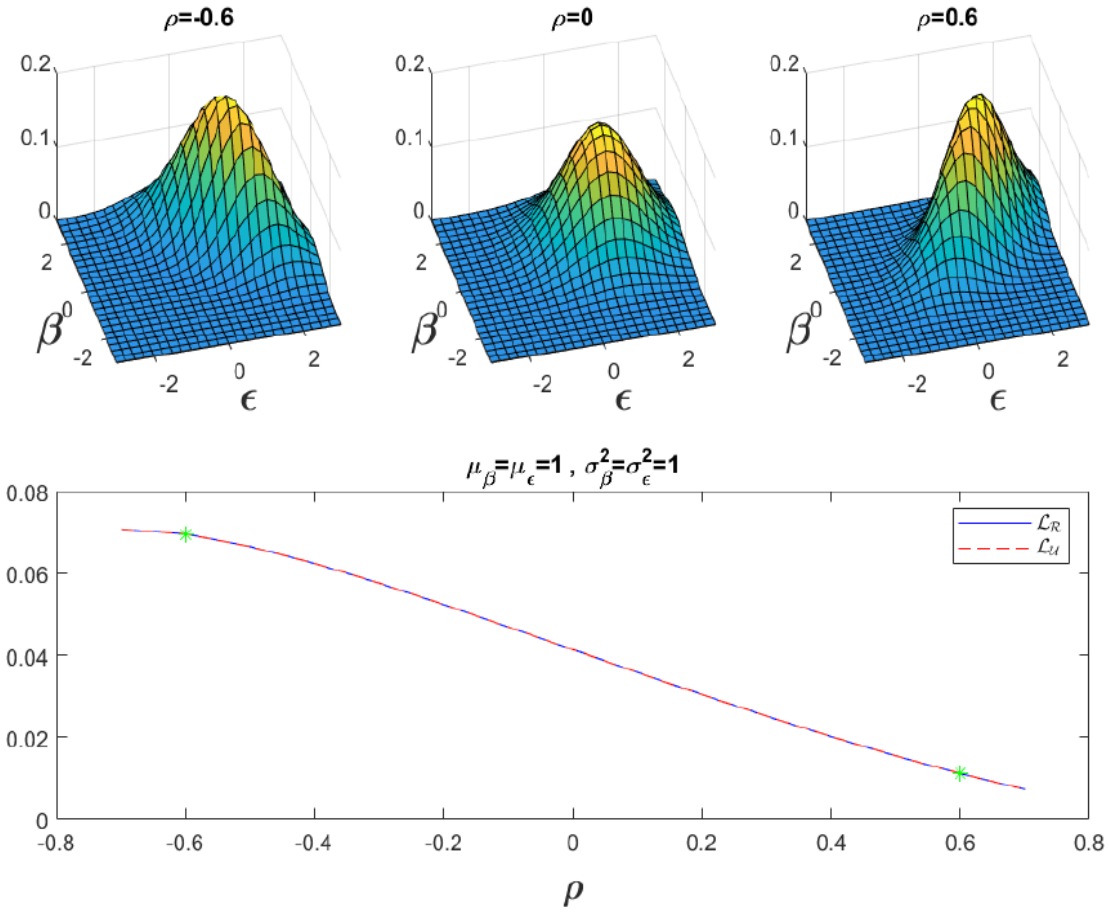

Figure 8: Effects of changing ρ

Figure 8 shows a family of proect types that differ in the correlation between local benefits and externalities, i.e. ρ. As we move away from the standard type by making the correlation negative, disagreement grows and this raises the number of mistakes and their costs. But this affects both parliaments in the same way. As we move away from the standard type by making the correlation positive, disagreement shrinks and this lowers the number of mistakes and their costs. But, again, this affects both parliaments in the same way. For any project such that the absolute size of local benefits exceeds that of externalities there is another one for which the reverse occurs. Thus, it makes no difference whether we assign these project types to the regional parliaments or the union parliament.

3.3 Choosing a benchmark

Proposition 1 provides a balanced and symmetric benchmark for the debate on centralization vs. decentralization. It recognizes that a decentralized system maximizes local benefits and it does not take externalities into account. But it also points out that a centralized system maximizes externalities and it does not take local benefits into account. Which is the least damaging alternative? How can we assign decisions so as to minimize inevitable losses?

To appreciate the extent to which this constitutes a change in perspective assume, as it is very often done, that decisions are made by social planners instead of parliaments. There are N regional planners that maximize total value for their respective region, and one union planner that maximizes total value for the union. Regional planners make the same choices and mistakes as the regional parliaments, as described in Equation (5) and (7). By definition, the union planner never makes mistakes: $\mathcal{U} = \mathcal{S}$ and $\mathcal{D}_{\mathcal{US}} = \emptyset$. This leads to a highly unbalanced or asymmetric benchmark: the union should make all decisions!

The traditional way to avoid this unrealistic result is to impose Oates' classic policy-uniformity constraint. In our context, this constraint implies that, for each project type, the union planner must either implement all projects or none: $\mathcal{U} \in \{\mathbb{R}^2, \emptyset\}$. Thus, we have that $\mathcal{U} = \mathbb{R}^2$ if $E(\beta + \varepsilon) \geq 0$; and $\mathcal{U} = \emptyset$ if $E(\beta + \varepsilon) < 0$. This implies that:

$$\mathcal{D}_{\mathcal{US}} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : (\beta + \varepsilon) E(\beta + \varepsilon) < 0\right\} \tag{9}$$

The union planner considers only the total or expected value of projects. If this value is positive, it implements all projects. Otherwise, it implements none. The union planner makes the right average decision, but it is then forced to apply this average decision to all regions. Not surprisingly, the union planner works well when policy preferences are homogeneous and there is little need for preference-matching.

It is instructive to compare Figures 5 and 9-10. Figures 9 and 10 show the set of mistakes of the regional and union planners. Figure 9 shows the case in which the expected value of projects is positive, while 10 shows the opposite case. Not surprisingly, regional parliaments and planners make the same decisions and therefore mistakes. But the union parliament and planner make different decisions. If the average value of the projects is positive (negative) and most of the projects are in the second (fourth) quadrant, their decisions are similar and so are their mistakes. Otherwise, their mistakes can be quite different. Note also that regional and union planners agree to make mistakes on some projects. For instance, in Figure

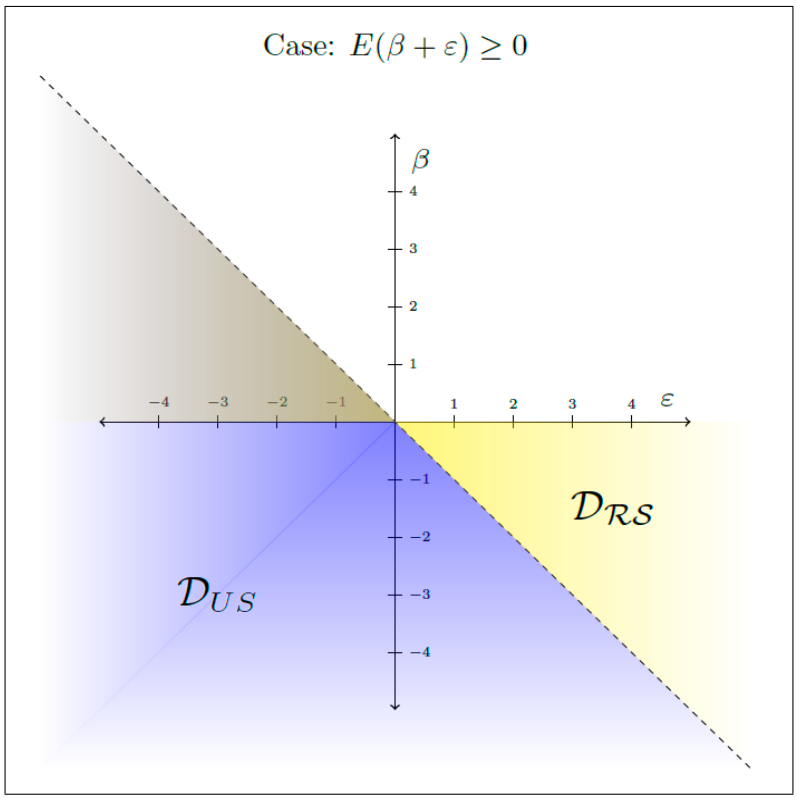

Figure 9: The sets $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{US}$ with social planners

9, both planners mke the same decisions for all projects in the first and fourth quadrant. But these decisions are wrong if externalities are negative and larger in absolute value than local benefits.

The following proposition shows the solution to the assignment problem when governments are modeled as social planners rather than parliaments:

Proposition 2 *Assume there are N regional planners plus one union planner whose decisions cannot be contingent on n. Then, the assignment rule that maximizes economic efficiency assigns the projects to the union planner if*

$$\mathcal{L}_{\mathcal{R}} = E\left(|\beta+\varepsilon||\,\mathcal{D}_{\mathcal{RS}}\right)\Pr\left(\mathcal{D}_{\mathcal{RS}}\right) > E\left(|\beta+\varepsilon||\,\mathcal{D}_{\mathcal{US}}\right)\Pr\left(\mathcal{D}_{\mathcal{US}}\right) = \mathcal{L}_{\mathcal{U}}$$

where $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ are defined in Equations (7) and (9), respectively. Otherwise, it assigns the projects to the corresponding regional planner.

Proposition 2 describes the "public-finance" or traditional approach in our context. Applications of this approach typically lead to statements such as "we should assign projects

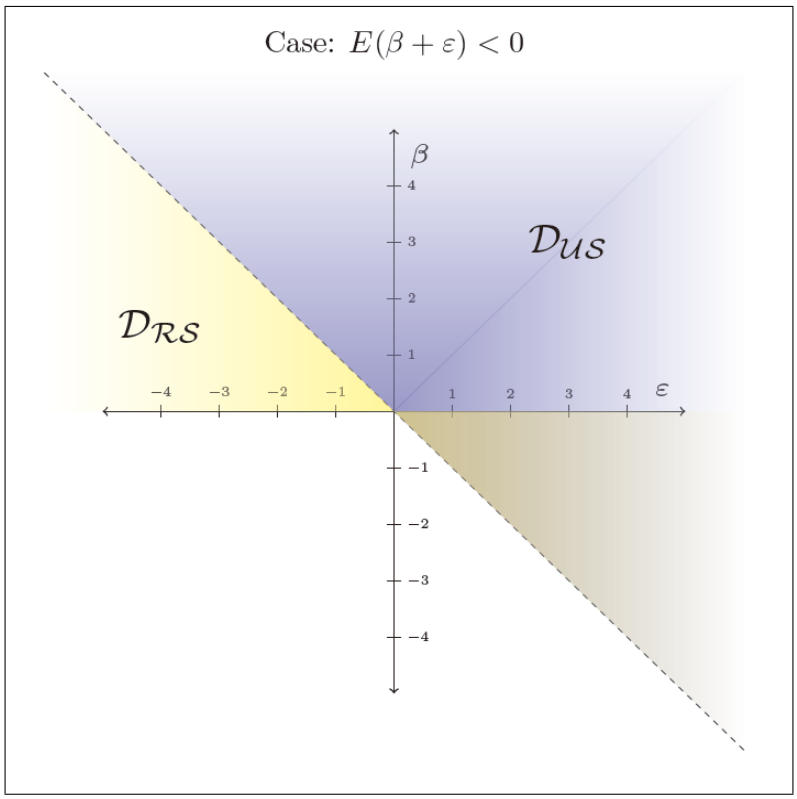

Figure 10: The sets $\mathcal{D}_{RS}$ and $\mathcal{D}_{US}$ with social planners

with small externalities to the region, and projects with large externalities to the union." In Figure 9 the union planner makes better decisions if most projects produce large positive externalities. In Figure 10, the union planner makes better decisions if most projects produce large negative externalities. The traditional approach also leads to statements such as "we should assign projects to the region if policy preferences are sufficiently heterogeneous, and to the union otherwise". Figures 9 and 10 also show that the region planner makes better decisions if most projects are such that $(\beta+\varepsilon)\,E\,(\beta+\varepsilon)<0$. These statements are often inconsistent with Proposition 1.

We should not be surprised though that the union parliament and planner behave differently. The union parliament has a sharp tool (it can condition decisions on the quality of projects), but it has the wrong objective (the preferences of the median voter). The union planner has the right objective (economic efficiency), but it has a blunt tool (it cannot condition decisions on the quality of projects). Both approaches lead to inefficiencies, but these are of a different kind. Thus, the approach presented here cannot be interpreted as providing a microfoundation for the classic policy-uniformity constraint. It is indeed something different.

3.4 Trading rights to decisions

There is yet another way to approach the debate of centralization vs decentralization that emphasizes markets rather than social planners. The Coasian approach argues that the solution to the problem of externalities is not a union parliament or social planner, but instead a union market for the rights to make decisions.

In our context, this market would work under these conditions:

Proposition 3 *Assume that (i) regions own the right to decide whether a project in their territory is implemented or discarded; (ii) regions can sell these rights in exchange for a monetary transfer by making take-it-or leave offers to other regions; and (iii) regions can solve free-rider problems and purchase these rights when it is in their common interest to do so. Then, it follows that:*

1. *Regions sell their rights to decide on projects in $\mathcal{D}_{\mathcal{RS}}$ (as defined in Equation (7)).*
2. *Regions do not sell their rights to decide on projects not in $\mathcal{D}_{\mathcal{RS}}$.*
3. *The efficient decisions are adopted and total value is maximized.*

The Coasian approach provides another unbalanced and asymmetric benchmark for the debate on centralization vs. decentralization: there is no need for a union, and all decisions should be assigned to the regions!

The assumptions needed for the Coasian bargain to work are too demanding, though. Let us start with assumption (i). Assigning property rights over policies is far more difficult in practice that it might seem at first sight. Should regions have the right to implement public projects that, say, deplete shared fishing stocks or raise pollution in other regions? If not, who owns these rights? Who decides and enforces them? Let us continue with assumption (ii). Markets work well if competitive. But a market for the rights to decide projects is essentially a bilateral monopoly, and there is little guarantee that outcomes be efficient in this context. Finally, consider assumption (iii). How do regions exactly solve their free-riding problem and act as a single buyer? The decision to purchase the rights from a given region constitutes a classic collective action problem from the point of view of the other $N-1$ regions. And we know that voluntary exchange mechanisms do not solve the underlying prisoner's dilemma situation of this problem. This requires coercive mechanisms such as voting.

Paradoxically, this takes us back to parliaments. Could it be that, rather than irrelevant, the union parliament is precisely the "market" that implements a Coasian bargain?

4 The union parliament: a market for policies?

If each project is voted in a separate bill, representatives cannot strike bargains such as "if you vote for my project, I vote for yours".[7] But project-by-project voting is just an artificial restriction that I have used strategically to derive Proposition 1 with minimal effort. Once we relax it, projects can be bundled in a single bill and bargains are possible. Can these bargains soften the externality-maximizing logic of the union parliament and make it sensitive to local benefits? If so, how much?

4.1 Is it possible to beat externality maximization?

A bill consists of a set of decisions. As it will become apparent soon, there is no loss of generality if we focus on "complete" bills that bundle all the decisions for a given project type. For instance, the bill $\mathcal{B}$ implements all projects in the set $\mathcal{B} \subseteq \mathbb{R}^2$. An important bill is $\mathcal{E} = \{(\beta, \varepsilon) \in \mathbb{R}^2 : \varepsilon \geq 0\}$. This bill maximizes externalities and replicates the outcome of project-by-project voting (see Equation (6)). Another important bill is $\mathcal{S} = \{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta + \varepsilon \geq 0\}$. This bill maximizes value and it produces the efficient or socially desirable decisions (see Equation (2)). Our goal is to determine whether bundling decisions moves the equilibrium away from the externality-maximizing logic of $\mathcal{E}$ and closer to the value-maximizing logic of $\mathcal{S}$.

To determine this, assume that the union parliament operates under an open agenda. This means that union representatives vote over pairs of bills, such that the winning bill in one round is set against a new alternative in the next round and the set of alternatives includes all feasible policies. A Condorcet winner is a bill that beats any other bill in a pairwise vote. If such a bill exists, the union parliament chooses it. Condorcet cycles occur when pairwise voting produces non-transitive collective preferences. In this case, the union parliament exhibits voting cycles and it fails to choose any bill.

The following result shows that a union parliament with an open agenda fails to deviate from externality-mazimization:

Proposition 4 *Assume the union parliament decides by majority rule with an open agenda. Then, either (i) $\mathcal{E}$ is a Condorcet winner or; (ii) there are Condorcet cycles.*

[7] Consider a bargain of this sort, with many regions and projects involved. For it to be relevant, this bargain changes the outcome of project-by-project voting for one or more projects. When the last of these projects is voted, everyone except the region has incentives to renege. Thus, the bargain unravels.

Thus, either the union parliament chooses the outcome of project-by-project voting, or it fails to produce a choice. This negative result essentially means that, with an open agenda, the union parliament cannot play the role of a "market for policies" where value-raising trades are made. In the rest of this subsection, I sketch the proof of Proposition 4 and develop intuitions that will help us sharpen the analysis.

Consider a given bill $\mathcal{B}$ and ask: who votes for $\mathcal{B}$ when paired against $\mathcal{E}$? Regions with projects not in $\mathcal{D}_{\mathcal{BE}}$ will not vote for $\mathcal{B}$. Both bills offer them the same local benefits, but $\mathcal{E}$ offers more externalities than $\mathcal{B}$. Thus, if there are regions that vote for $\mathcal{B}$ we must find them in $\mathcal{D}_{\mathcal{BE}}$. But not all regions in $\mathcal{D}_{\mathcal{BE}}$ vote for $\mathcal{B}$. Some might vote still vote for the bill $\mathcal{E}$ because the bill $\mathcal{B}$ offers them a loss in local benefits, or a gain in local benefits that is too small to compensate for the loss of externalities. Thus, the coalition of regions that vote for $\mathcal{B}$ are those with projects located in:

$$\mathcal{C}_{\mathcal{BE}} = \{(\beta, \varepsilon) \in \mathcal{D}_{\mathcal{BE}} : \beta\varepsilon < 0 \text{ and } |\beta| \geq E\left(|\varepsilon| | \mathcal{D}_{\mathcal{BE}}\right) \Pr\left(\mathcal{D}_{\mathcal{BE}}\right)\} \tag{10}$$

The bill $\mathcal{B}$ changes (with respect to $\mathcal{E}$) all the decisions on projects in $\mathcal{D}_{\mathcal{BE}}$. Since the decisions in $\mathcal{E}$ maximize externalities, the bill $\mathcal{B}$ destroys positive externalities for projects such that $\varepsilon > 0$, and creates negative externalities for projects such that $\varepsilon < 0$. The total value of this loss is $E\left(|\varepsilon| | \mathcal{D}_{\mathcal{BE}}\right) \Pr\left\{\mathcal{D}_{\mathcal{BE}}\right\}$ and it affects all regions. Bill $\mathcal{B}$ also produces a change in local benefits equal to $-|\beta|$ in regions with non-conflictual projects, i.e. $\beta\varepsilon > 0$; and equal to $|\beta|$ in regions with conflictual projects, i.e. $\beta\varepsilon < 0$. Thus, Equation (10) says that the regions that join the coalition are those with conflictual projects whose gain in local benefits exceeds the loss of externalities.

Figure 11 shows this graphically. The set $\mathcal{D}_{\mathcal{BE}}$ is shown as a circle (it could take any other shape, of course!). Regions not in $\mathcal{D}_{\mathcal{BE}}$ vote against $\mathcal{B}$. Regions in the red area in $\mathcal{D}_{\mathcal{BE}}$ also vote against $\mathcal{B}$. The coalition $\mathcal{C}_{\mathcal{BE}}$ that supports $\mathcal{B}$ consists of the regions with projects in the two green areas. The bill $\mathcal{B}$ beats $\mathcal{E}$ in a pairwise vote if and only if these areas contain at least half of the regions, i.e. $\Pr\left(\mathcal{C}_{\mathcal{BE}}\right) \geq 0.5$. How likely is this? I shall soon describe the bill $\mathcal{B}$ that provides the toughest competition to $\mathcal{E}$. This will allow us to obtain a more precise answer to this question. But it should be already clear that externality-maximization cannot be beaten easily. For instance, if more than half of the regions have non-conflictual projects, then $\mathcal{E}$ is a Condorcet winner.

If there does not exist a bill $\mathcal{B}$ that beats $\mathcal{E}$ in a pairwise vote, then $\mathcal{E}$ is Condorcet winner and the union parliament chooses it. This proves the first part of Proposition 4. We need

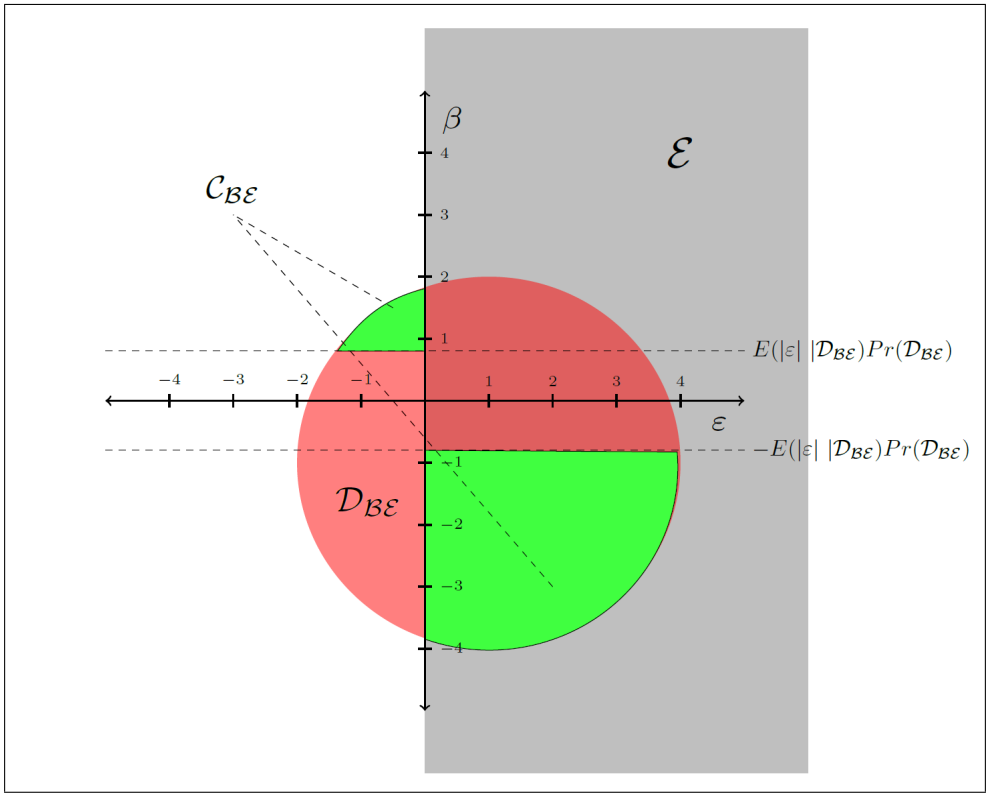

Figure 11: The coalition $\mathcal{C}_{\mathcal{BE}}$ supporting $\mathcal{B}$ against $\mathcal{E}$

to show now the second part. That is, we want to show next that, if there exists a bill $\mathcal{B}$ that beats $\mathcal{E}$ in a pairwise vote, then the union parliament exhibits voting cycles and fails to choose any bill.

The proof is in two steps. First, we show that only $\mathcal{E}$ can be a Condorcet winner. Take any bill $\mathcal{B}$ that beats $\mathcal{E}$ and construct from it a modified bill $\hat{\mathcal{B}}$ that is identical to $\mathcal{B}$ except that it changes the decisions for some regions in $\mathcal{C}_{\mathcal{B}E}$. All other regions prefer $\hat{\mathcal{B}}$ to $\mathcal{B}$, since $\hat{\mathcal{B}}$ offers them more externalities with the same local benefits. Since it is always possible to change the decisions for a set of regions in $\mathcal{C}_{\mathcal{B}E}$ whose combined size is less than half, a modified bill $\hat{\mathcal{B}}$ that beats $\mathcal{B}$ always exists.[8]

Second, we show that it is always possible to construct a modified bill $\hat{\mathcal{B}}$ that beats $\mathcal{B}$ *and* it does not beat $\mathcal{E}$. This is done by changing the decision of a set of regions whose combined size exceeds a fraction $\Pr(\mathcal{C}_{\mathcal{B}E}) - 0.5$ of the total number of regions, but falls short of half of them. Then, $\mathcal{B}$ beats $\mathcal{E}$, $\hat{\mathcal{B}}$ beats $\mathcal{B}$, and $\mathcal{E}$ beats $\hat{\mathcal{B}}$. This proves that, if $\mathcal{E}$ is not a Condorcet

[8]This logic does not work for $\mathcal{E}$. It is not possible to find regions such that, if their decisions are changed, externalities grow. This is why $\mathcal{E}$ is the only bill that can be a Condorcet winner. For any other bill, these regions can always be found in $\mathcal{C}_{\mathcal{B}E}$.

winner, the union parliament exhibits Condorcet cycles.[9]

The conclusion is clear: with an open agenda it is not possible to beat externality-maximization in the union parliament. Even worse, the union parliament might fail to make a choice. Thus, we are forced to consider restrictions on the agenda.

4.2 Parliamentary bargains

I use a model of legislative barganing that has been used before by Ferejohn, Fiorina and McKelvey (1987) and Lockwood (2002) in very similar contexts. This is an agenda-setter type of model. An agenda is an ordered list of bills to be voted. In this model, there is a special bill called the status quo which is always included as the last item on the agenda. Here, I choose externality-maximizing as the status quo.[10] The rules of the game are as follows:

1. Representatives simultaneously propose bills. The agenda includes all proposed bills in a random order with the status quo added at the end: $\{\mathcal{B}_1, \mathcal{B}_2, ..., \mathcal{E}\}$.

2. Representatives vote the bills sequentially, i.e. $\mathcal{B}_1$ against $\mathcal{B}_2$, the winner against $\mathcal{B}_3$, the winner against $\mathcal{B}_4$, and so on until $\mathcal{E}$. A bill $\mathcal{B}^*$ that wins this contest is a political equilibrium.

By winning the contest, I mean that $\mathcal{B}^*$ is a sub-game perfect equilibrium of this two-stage game. The following proposition shows that a bill $\mathcal{B}^*$ always exists and is unique. Moreover, despite the random formation of the agenda, the result of this voting game is not random:

Proposition 5 *Let $\mathbb{B} \subset \mathbb{R}^2$ be the set of bills that that beats $\mathcal{E}$ in a pairwise vote. If $\mathbb{B}$ is empty, then $\mathcal{B}^* = \mathcal{E}$. If $\mathbb{B}$ is not empty, then $\mathcal{B}^* = \overline{\mathcal{E}}$, where $\overline{\mathcal{E}}$ is the bill that maximizes externalities in $\mathbb{B}$.*

[9] We can see now why focusing on "complete" bills entails no loss of generality. Breaking a bill into two or more bills, each of them with a partial set of decisions, is never a good idea. Each of these "partial" bills always receives less support than the "complete" bill that incorporates all of them. Hence, if there exists a set of "partial" bills that beats the externality-maximizing logic, the "complete" bill also beats it. The converse is not true.

[10] This role of $\mathcal{E}$ as the status quo captures the idea that, if a bargain cannot be agreed upon, we return to project-by-project voting.

Proposition 5 says that "if externality-maximizing can be beaten, it will be beaten." In this sense, the procedural rules chosen give the union parliament the best chance to escape its externality-maximization logic. But this escape does not seem to take us too far. Proposition 5 then adds " ... but it will be beaten by the closest bill among those that can beat it." Obviously, the economic implications of Proposition 5 depend on how often $\mathcal{B}^* \neq \mathcal{E}$ and, when this happens, how different are $\mathcal{E}$ and $\overline{\mathcal{E}}$. I shall explore these questions soon enough. But let us first sketch the proof of Proposition 5.

If $\mathbb{B}$ is empty, $\mathcal{E}$ will beat any bill that it meets in the last round. Thus, we just need to prove that, if $\mathbb{B}$ is not empty, then $\mathcal{B}^* = \overline{\mathcal{E}}$. The proof contains a couple of steps. The first one is to show that, if $\mathbb{B}$ is not empty, the bill $\overline{\mathcal{E}}$ is the Condorcet winner in $\mathbb{B}$. By this, I mean that $\overline{\mathcal{E}}$ beats any other bill in $\mathbb{B}$ in a pairwise vote. To see this, take any bill $\mathcal{B} \in \mathbb{B}$. In a pairwise vote with $\overline{\mathcal{E}}$, all regions in $\mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}$ prefer $\overline{\mathcal{E}}$ to $\mathcal{B}$. The bill $\mathcal{B}$ cannot offer these regions more local benefits or more externalities than the bill $\overline{\mathcal{E}}$. Since $\overline{\mathcal{E}} \in \mathbb{B}$, we know that $\Pr\left(\mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}\right) \geq 0.5$ and, as a result, $\overline{\mathcal{E}}$ beats any $\mathcal{B} \in \mathbb{B}$. Thus, the bill $\overline{\mathcal{E}}$ is the bill that earns more support among those in $\mathbb{B}$, and therefore the one that provides the toughest competition to $\mathcal{E}$.

The second step of the proof is to show that, if $\mathbb{B}$ is not empty, then $\overline{\mathcal{E}}$ is the political equilibrium. This follows from two observations. The first one is that, if $\overline{\mathcal{E}}$ is in the agenda, it will win the contest. The coalition that supports $\overline{\mathcal{E}}$ against $\mathcal{E}$ will not vote for any other bill. The reason is that, if there were an alternative bill that is preferred in a pairwise competition aginst $\overline{\mathcal{E}}$, this bill is not in $\mathbb{B}$ and it would end up losing the contest to $\mathcal{E}$. The second observation is that, knowing this, members of the coalition $\mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}$ have an incentive to propose $\overline{\mathcal{E}}$ in the first stage. Thus, we reach the conclusion that, if $\mathbb{B}$ is not empty, the unique political equilibrium is $\overline{\mathcal{E}}$.

How does the bill $\overline{\mathcal{E}}$ look like? Since it maximizes externalities in $\mathbb{B}$, it must be the case that: (i) $\mathcal{D}_{\overline{\mathcal{E}}\mathcal{E}} = \mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}$; and (ii) $\Pr\left(\mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}\right) = 0.5$. Any decision that differs from the externality-maximizing bill lowers externalities. Thus, there is no need to change decisions for regions that do not vote for the bill anyway, hence $\mathcal{D}_{\overline{\mathcal{E}}\mathcal{E}} = \mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}$. There is no need either to change decisions for regions once their vote is no longer needed to pass the bill, hence $\Pr\left(\mathcal{C}_{\overline{\mathcal{E}}\mathcal{E}}\right) = 0.5$. Thus, the bill $\overline{\mathcal{E}}$ changes the decisions (with respect to $\mathcal{E}$) of a minimum winning coalition of regions that are unhappy with the low local benefits they obtain under externality-maximization.

To gain further insight on the shape of $\overline{\mathcal{E}}$, define a new bill $\mathcal{X}$ that changes a set of decisions $\mathcal{D}_{\mathcal{X}\mathcal{E}}$ (with respect to $\mathcal{E}$), as shown in Figure 12. To construct this bill, I follow

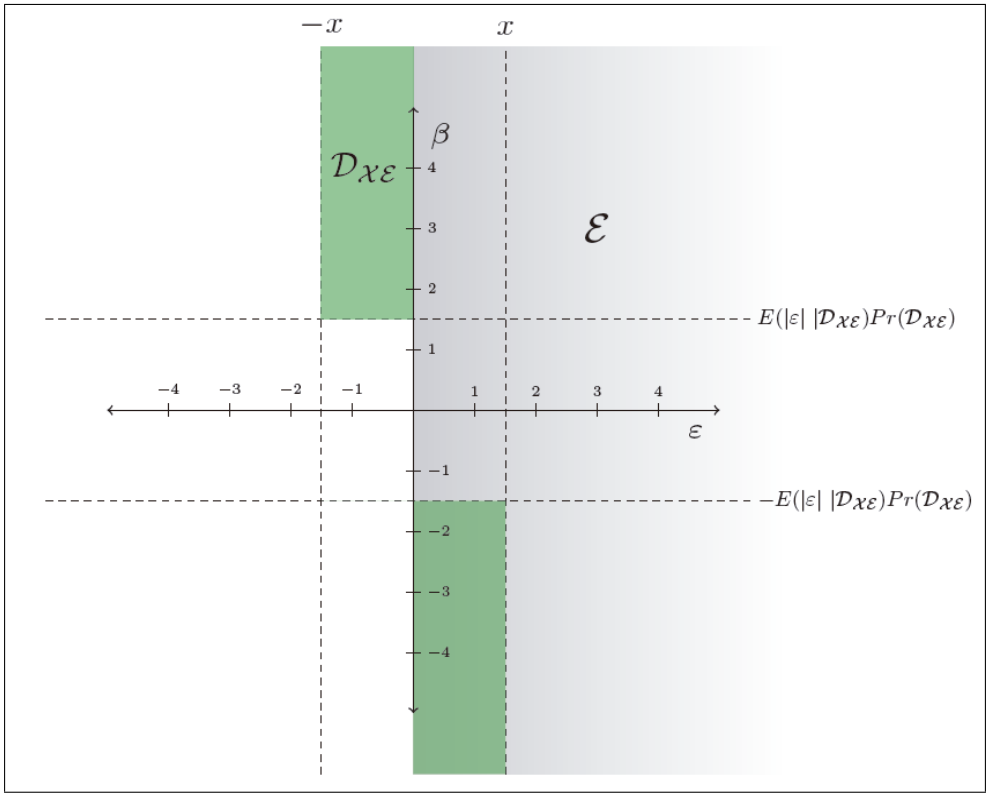

Figure 12: The set $\mathcal{X}$

a two-step procedure: (i) a call is issued to join a coalition against $\mathcal{E}$ to all regions whose projects produce externalities less than x in absolute value; and (ii) regions that respond positively to the call are included in $\mathcal{D}_{\mathcal{XE}}$. Formally, I fix a value $x \geq 0$,and define $\mathcal{D}_{\mathcal{XE}}$ as the fixed point of the following two equations:

$$\mathcal{D}_{\mathcal{XE}} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta\varepsilon < 0 \ \text{ and } \ |\beta| \geq z \text{ and } |\varepsilon| \leq x\right\}$$

$$z = E\left(|\varepsilon||\,\mathcal{D}_{\mathcal{XE}}\right)\Pr\left(\mathcal{D}_{\mathcal{XE}}\right)$$

This means that $\mathcal{X}$ changes decisions only for members of the coalition, i.e. $\mathcal{D}_{\mathcal{XE}} = \mathcal{C}_{\mathcal{XE}}$. As Figure 12 shows, $\mathcal{D}_{\mathcal{XE}}$ consists of two green open rectangles in the second and fourth quadrants next to the Y-axis. Thus, $\mathcal{X}$ consists of $\mathcal{E}$ minus the green open rectangle in the second quadrant, plus the green open rectangle in the fourth quadrant.

We can construct an entire family of bills $\mathcal{X}$, indexed by x. Figure 13 shows some of its members. Naturally, $\mathcal{E}$ is the member with index $x = 0$. As x increases, the base of the open rectangles becomes wider, but it shifts away from zero. It becomes wider because the call admits more members. It shifts shifts away from zero because, as new members enter,

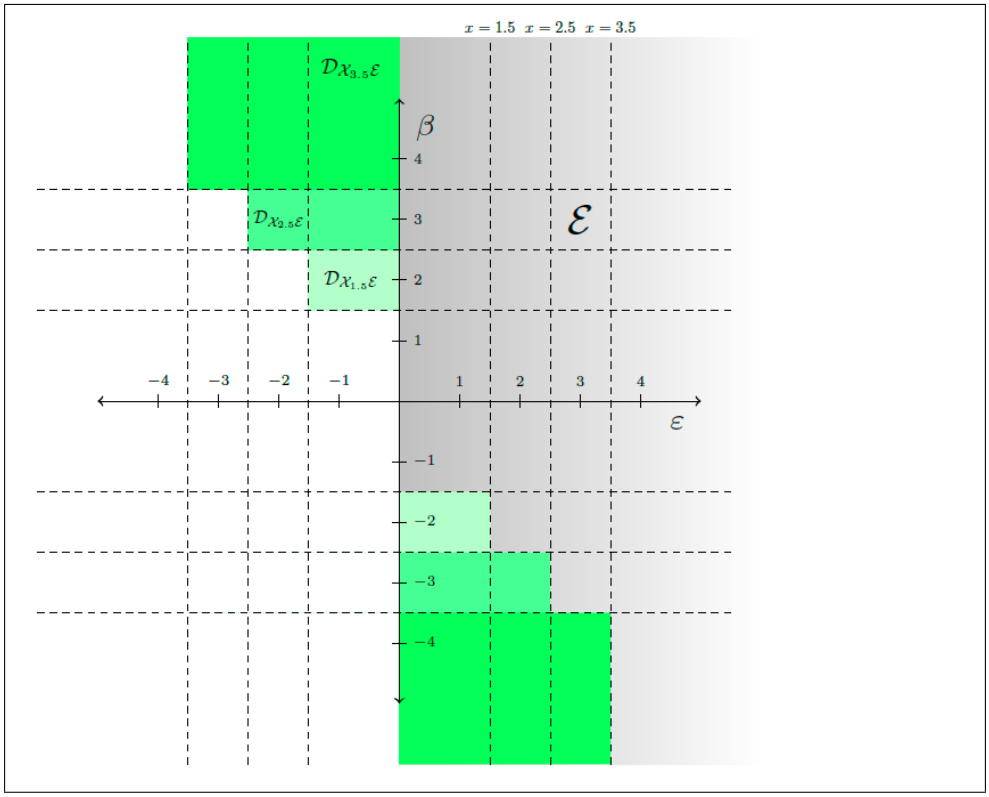

Figure 13: A family of bills $\mathcal{X}$

externalities shrink, and some old members abandon the coalition. This family is interesting because it guarantees the best trade-off between coalition size and externalities.[11] If there is no member of the family such that $\Pr(\mathcal{D}_{\mathcal{X}\mathcal{E}}) \geq 0.5$, then $\mathbb{B}$ is empty. Otherwise, the bill $\overline{\mathcal{E}}$ is the member of the family that minimizes x subject to $\Pr(\mathcal{D}_{\mathcal{X}\mathcal{E}}) = 0.5$.

The bill $\overline{\mathcal{E}}$ nicely formalizes the notion of a parliamentary bargain. Indeed, this bill literally says "projects of coalition members are decided by the corresponding member, while projects of non-members are decided to maximize externalities." These bargains can be interpreted as attempts to correct the externality-maximizing logic of the union parliament and give some weight to local benefits.

Unfortunately, these attempts are quite clumsy. Figure 14 shows a bargain bill $\overline{\mathcal{E}}$ that only reverses bad decisions, i.e. $\mathcal{D}_{\overline{\mathcal{E}}\mathcal{E}}$ is in $\mathcal{D}_{\mathcal{E}\mathcal{S}}$. This bill unambiguously improves efficiency with respect to externality maximization. For this bill to be an equilibrium, at least half of the projects must be in $\mathcal{D}_{\overline{\mathcal{E}}\mathcal{E}}$. The good news is that, if this bargain exists, the bill produces

[11] A bill that that does not belong to this family has gaps, i.e. it does not include as members some regions with low-externality projects. It is then always possible to construct a bill that increases both coalition size and externalities by filling these gaps.

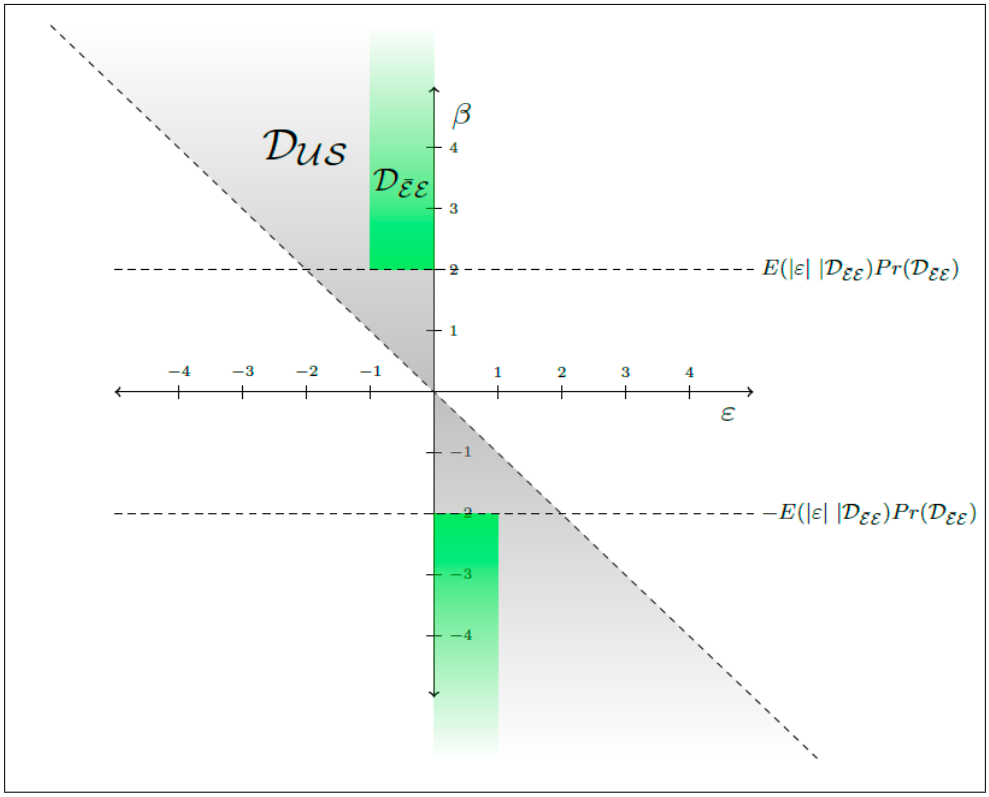

Figure 14: A bargain bill that only reverses bad decisions

a large improvement in efficiency by reversing bad decisions for half of the projects. The bad news is that, for this bargain to exist, the union parliament must be a worse social choice mechanism than deciding projects by tossing a coin!

Figure 15 shows a bargain bill that reverses both good and bad decisions, i.e. $\mathcal{D}_{\bar{\mathcal{E}}\mathcal{E}}$ is not in $\mathcal{D}_{\mathcal{E}\mathcal{S}}$. The good news is that such a bargain can now be successful even if the union parliament is better than coin-tossing. The bad news is that this comes at the cost of worsening the bargain. Projects not in $\mathcal{D}_{\mathcal{E}\mathcal{S}}$ are projects for which externality-maximization makes the right decision and the bargain changes it. Let us say, for instance, that a bargain is possible when the union parliament makes 25 percent of mistakes. Then, less than 25 percent of the decisions that the bargain reverses were bad, and more than 25 percent were good. Thus, the bargain raises the share of mistakes!

This discussion suggests that parliamentary bargains increase the efficiency of the union parliament only if externality-maximization is a very poor criterion to choose projects. But, under these circumstances, regional parliaments with their local-benefits maximization logic are likely to make better decisions than any bargain bill that comes out from the union parliament.

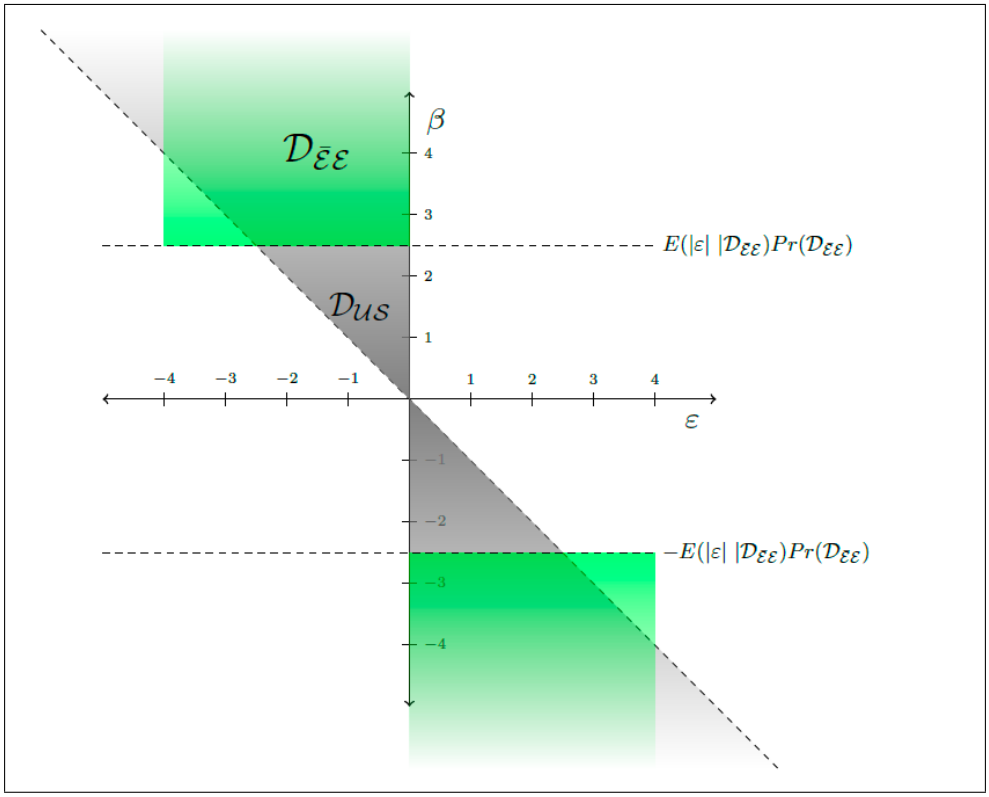

Figure 15: A bargain bill that reverses good and bad decisions

As a final point, it is worth mentioning that bills that bundle project decisions and regional transfers are not likely to work in this context either. A minimum winning coalition of regions will arise that decides on the projects of coalition members to maximize local benefits, decides on the projects of non-members to maximize externalities, and bundles these decisions with a transfer scheme that redistributes as much as possible from non-members to members. It might be possible to design some ex-ante restrictions on transfer schemes that could help. A serious analysis of this point would force us however to delve deeper into the question of how incomplete fiscal constitutions are. This is certainly an important and very interesting topic, but I shall not explore it here.

5 Project costs and non-uniform externalities

Projects have costs, and taxes must be raised to fund them. If project funding were independent of the assignment rule, all the analysis in the previous sections would apply directly. We would only need to re-define β as local benefits minus the part of the cost paid by taxes on the region, and ε as externalities minus the part of the cost paid by taxes on all the other

regions. But project funding typically depends on the assignment rule. Parliaments raise taxes to pay for the projects they decide. And taxation is proportional to representation. If a project is assigned to a regional parliament, its cost is paid by the region. If the project is instead assigned to the union parliament, its cost is paid by the union. How does this cost-shifting effect influence the analyisis?

Externalities are not uniformly distributed. For some projects, such as infraestructures or pollution abatement, externalities are larger in nearby regions than in faraway regions. For some other projects, such as regulation of industry standards or incentive programs for R&D, externalities are larger for regions that are close competitors in export markets than for regions that are not. It might even be that the same project has positive externalities for some regions and negative for others. How do non-uniform externalities affect the analysis?

To simplify the exposition, I return to the case in which each project is voted on a separate bill. We have seen already that it is unlikely that removing this assumption has much of an impact on the analysis.

5.1 A generalization of the model

A project type is now defined by a distribution $F(\beta, \varepsilon)$, a monetary cost θ, and a distribution of externalities with support $(\omega_1, ..., \omega_{N-1})$ such that $\sum_{j=1}^{N-1} \omega_j = \dfrac{1}{N-1}$. Thus, a region that draws ω receives externalities equal to $\omega\varepsilon$. We assume that this distribution is symmetric across regions, so that $E(\omega) = \dfrac{1}{N-1}$ for all $n \in \mathcal{N}$. Thus, ex-ante all projects are identical not only in terms of their quality, but also on the distribution of externalities. Ex-post, though, projects differ not only in their quality, but also on the distribution of externalities. Let $M(\omega)$ be the median of this distribution. In the previous sections, $M(\omega) = E(\omega)$ because externalities were uniformly distributed across regions: $\omega_1 = ... = \omega_{N-1} = \dfrac{1}{N-1}$. This need not be the case now. We keep the rest of assumptions.

With project costs, the set $\mathcal{S}$ of efficient or socially desirable projects is now given by:

$$\mathcal{S} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta + \varepsilon \geq \theta\right\} \tag{11}$$

Figure 16 shows the set $\mathcal{S}$. Projects have three pieces now: local benefits, externalities and costs, and the three have to be taken into account. Essentially, Equation (11) says "implement projects whose value is not lower than its cost and discard the rest".

Projects are funded by the parliament that decides them. The correspsonding region

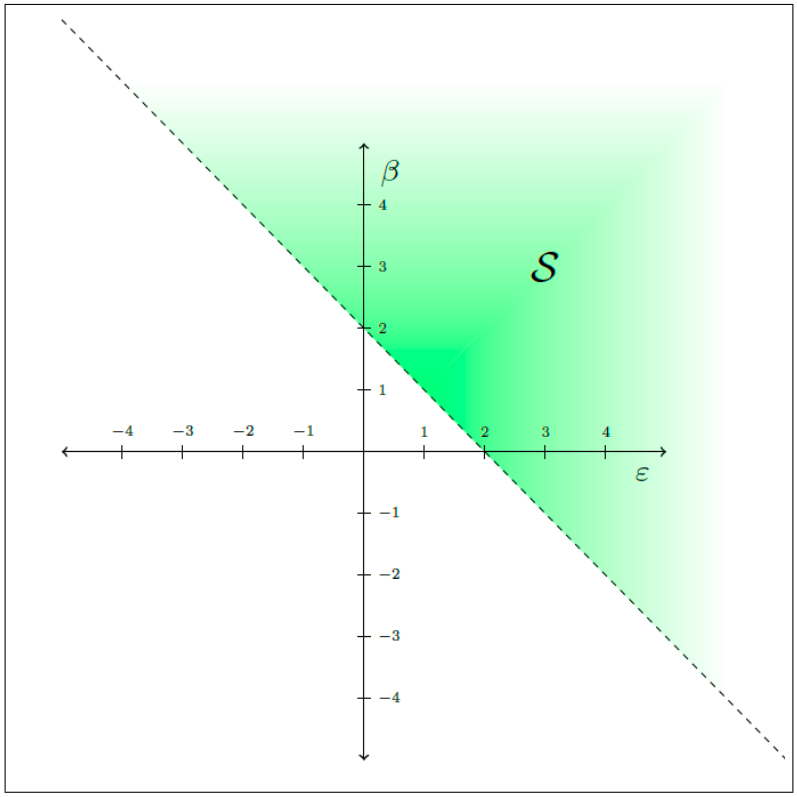

Figure 16: The set $\mathcal{S}$ with project costs

pays the cost of projects assigned to regional parliaments. Each region pays a fraction $\frac{1}{N}$ of the cost of projects assigned to the union parliament. Since all regions are still identical ex-ante, they all agree on the following assignment rule:

$$P = \arg\max E\left(\beta + \varepsilon - \theta \middle| P\right) \tag{12}$$

That is, the assignment rule maximizes the ex-ante value of projects net of costs.

5.2 The assignment rule re-visited

In regional parliaments, the median voters are citizens of the region. Thus, regional parliaments implement projects if and only if local benefits exceed the cost of the project:

$$\mathcal{R} = \left\{(\beta, \varepsilon) \in \mathbb{R}^2 : \beta \geq \theta\right\} \tag{13}$$

Not surprisingly, regional parliaments remain unconcerned with externalities. They simply maximize local benefits minus total cost.

The median voter of the union receives a fraction $M(\omega)$ of the externalities generated by the project, and pays a fraction $\frac{1}{N}$ of it. Thus, the union parliaments implements the following projects:[12]

$$\mathcal{U} = \left\{ (\beta, \varepsilon) \in \mathbb{R}^2 : \frac{M(\omega)}{E(\omega)} \varepsilon \geq \theta \right\} \tag{14}$$

The union parliament values each unit of monetary costs as being equivalent to $\frac{M(\omega)}{E(\omega)}$ units of monetary externalities. Thus, we can think of $\frac{M(\omega)}{E(\omega)}$ as some sort of price of externalities in terms of project costs. If the median voter receives more externalities than average, then this price exceeds one. If the median voter receives less externalities than average, then this price falls short of one.

Since nothing precludes the case in which $M(\omega) < 0$, the price of externalities might be negative. In this case, the union parliament not only disregards local benefits, but it also dislikes externalities. This is apparent in the case in which there are no costs, i.e. $\theta = 0$. Then, if $M(\omega) < 0$ the union parliament implements projects if and only if $\varepsilon < 0$. That is, the union parliament disregards local benefits and minimizes externalities! Perhaps there are some real-world project types that conform to this perverse outcome. But I rule out this possibility from now on by assuming that $M(\omega) > 0$.

With this assumption, these are the sets of mistakes made by the regional and union parliaments:

$$\mathcal{D}_{\mathcal{RS}} = \left\{ (\beta, \varepsilon) \in \mathbb{R}^2 : (\beta - \theta)\varepsilon < 0 \text{ and } |\beta - \theta| < |\varepsilon| \right\} \tag{15}$$

$$\mathcal{D}_{\mathcal{US}} = \left\{ (\beta, \varepsilon) \in \mathbb{R}^2 : \beta \left(\frac{M(\omega)}{E(\omega)} \varepsilon - \theta \right) < 0 \text{ and } \left| \beta - \theta \frac{E(\omega) - M(\omega)}{M(\omega)} \right| > \left| \varepsilon - \theta \frac{E(\omega)}{M(\omega)} \right| \right\} \tag{16}$$

These sets converge to those in Equations (7) and (8) if the are no costs, i.e. $\theta = 0$; and externalities are uniform, i.e. which implies $M(\omega) = E(\omega)$.

Figure 17 shows the case of uniform externalities: $M(\omega) = E(\omega)$. The cost-shifting effect creates a bias towards discarding projects. The intersection of $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ produces a triangle in which both parliaments agree on discarding projects that have positive social value. Each parliament compares only a part of the benefit of the project against its entire cost. In this triangle the cost of projects in this triangle exceeds both local benefits and externalities separately, but not their sum.

[12] Here, I am using again the large N approximation $E(\omega) = \frac{1}{N-1} \approx \frac{1}{N}$.

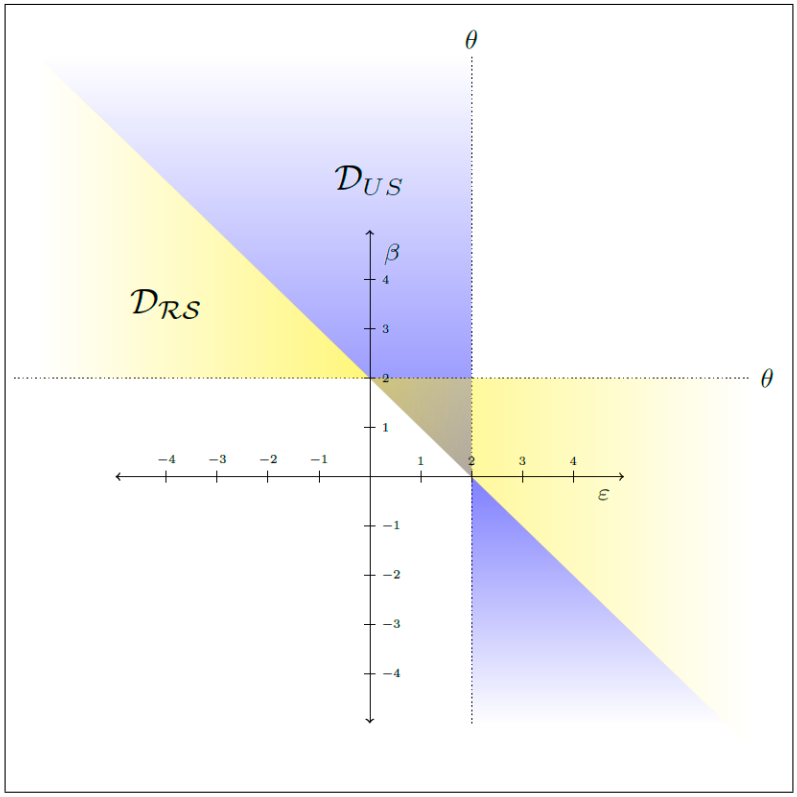

Figure 17: The sets $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ with project costs and uniform externalities

Figures 18 and 19 show the cases in which externalities are not uniform: $M(\omega) < E(\omega)$ and $M(\omega) > E(\omega)$, respectively. In Figure 18, the price of externalities is less than one, and this amplifies the cost shifting effect. In Figure 19, the price of externalities exceeds one, and this dampens the cost-shifting effect.[13] As it often happens in economics, two "wrongs" can make a "right".

We can now state a more general version of the assignment result that allows for project costs and non-uniform externalities:

Proposition 6 *Assume there are N regional parliaments plus one union parliament, and that each project is voted in a separate bill. Then, the assignment rule that maximizes economic efficiency assigns the projects to the union parliament if*

$$\mathcal{L}_{\mathcal{R}} = E\left(|\beta + \varepsilon|| \mathcal{D}_{\mathcal{RS}}\right) \Pr\left(\mathcal{D}_{\mathcal{RS}}\right) > E\left(|\beta + \varepsilon|| \mathcal{D}_{\mathcal{US}}\right) \Pr\left(\mathcal{D}_{\mathcal{US}}\right) = \mathcal{L}_{\mathcal{U}}$$

[13] These statements are a bit imprecise. Since other areas of the plane are shifting, too, the specific shape of the distribution of projects $F(\beta, \varepsilon)$ matters. Nevertheless, these statements convey the key intuitions that the theory reveals.

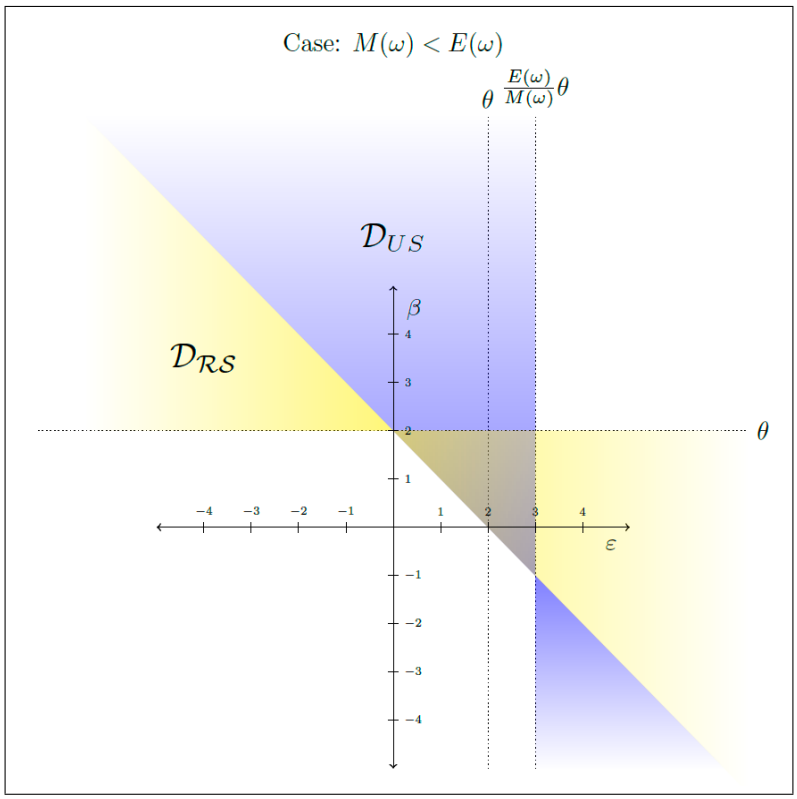

Figure 18: The sets $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ with project costs and non-uniform externalities

where $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ are defined in Equations (15) and (16), respectively. Otherwise, it assigns the projects to the corresponding regional parliament.

Essentially, project costs and non-uniform externalities do not affect much the logic behind the assignment rule derived in section 3. All the discussion around Proposition 1 still holds, with some adjustments. The presence of project costs worsens the performance of both regional and union parliaments, but it is unclear which one of the two is most negatively affected. The presence of non-uniform externalities has no effect on regional parliaments, but it distorts how the union parliament values externalities. These intuitions can help guide the analysis of specific project types in applied work.

6 Concluding remarks

I shall not repeat the main results, which were described in the introduction and then made precise in the various propositions developed in the lecture. Instead, I shall now use these last words to recognize that the analysis performed here is seriously incomplete. I have developed a simple benchmark to think about the geographical structure of the state, and the practical

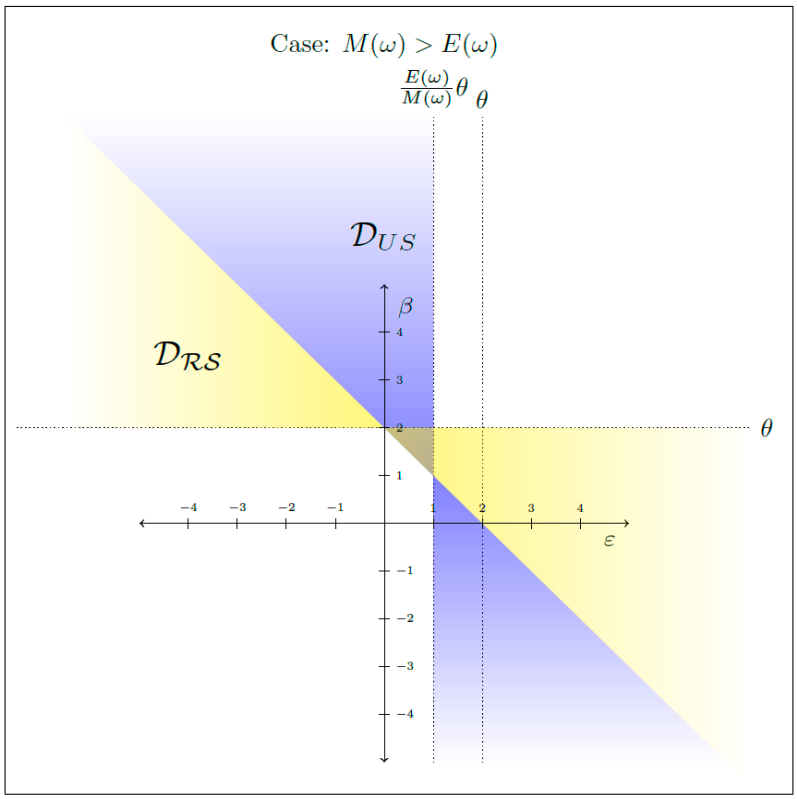

Figure 19: The sets $\mathcal{D}_{\mathcal{RS}}$ and $\mathcal{D}_{\mathcal{US}}$ with project costs and uniform externalities

question of centralization vs decentralization of political decisions. Its most remarkable aspect is how insensitive is the union government to local benefits. This benchmark needs to be extended in many directions. In particular, I have taken two radical or brutal shortcuts to obtain simple results quickly and comfortably. I believe the intuitions behind these results are robust. But we need to explore how they look like when we go through the full route, without taking the easy shortcuts.

The first shortcut has been a very generous use of symmetry and the large group case. The world depicted here contains many symmetrical and small regions. We need only look at the map of Europe to understand that some regions (whether we think of them as countries or Länder) are large and asymmetric in many different ways. Extending the theory to consider large regions and key asymmetries is likely to deliver important new and unexpected results.

The second shorcut is that I have simply ignored the selection of representatives and projects. That is, I have ignored at least half of the literature on the "political economy" approach I mentioned in the introduction. How are representatives selected for parliament? How are projects selected for voting? We know the answers to these questions depend on the fiscal constitution, and this is likely to affect the results derived here. How much of

the overall view that emanates from the approach presented here will survive after these important aspects of the problem are no longer ignored?

The analysis presented here broadly suggests how to make the theory operative. But the devil is always in the details. Is it possible to identify projects types empirically and estimate the joint distribution of their local benefits and externalities? If so, are empirically observed assignment rules consistent with the theory? If not, are there recognizable patterns to the observed deviations?

I started by saying that the topic of this lecture, centralization vs decentralization of political decisions, is timely given the pace at which the European project is moving forward. I also said that academic economists have much to contribute to our understanding of this problem. The ideas put forward here constitute my grain of sand towards this goal.

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